CURRICULUM

A. DOCTOR of PHILOSOPHY DEGREE

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

The general mission of graduate education for the Ph.D. 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: (1) to provide academic training in current knowledge in the field through graduate-level coursework; (2) to develop in-depth basic research ability in a particular area within the discipline, through basic at-the-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) to develop instructional skills through teaching undergraduate laboratories; (4) to develop substantive writing ability through completion of a dissertation and most probably manuscript as well on the research performed; and, (5) to 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; and/or (c) qualify you for a research scientist or postdoctoral position in industry.

GENERAL REQUIREMENTS for ALL Ph.D. STUDENTS

1. Completion of a common core curriculum (see below).

2. Beginning in your 2nd year, students must enroll in student seminar series every semester. Example of seminar series are following:
BIOL 701 – Cellular and Molecular Proteins (CaMP) Seminar. **BIOL 905** – Advanced Molecular Genetics (AMG) Seminar. **BIOL 902** – Advanced Molecular Cellular Biology (AMCB) Seminar.

3. Two semesters (minimum) of graduate teaching are required.

4. During the beginning of the second year of graduate study, a graduate advisory committee must be established. This committee must meet **at least once per academic year**. Annual committee meetings are **mandatory** for graduate students. However, the mentor – supported by the graduate advisory committee – may request an exception to this rule. The petition from the mentor should explain the reason behind the exception and should schedule an annual committee meeting within 3 months. (How to say protecting confidentiality here?) The Annual Report Form with signatures of committee members must be sent to the Graduate Program Coordinator after annual committee meetings.

5. Students must enroll in "Research Grant Proposal Preparation" (**BIOL 925**) or take an equivalent, graduate-level grant development course. The MB Director of Graduate Studies must approve this alternative course.

6. Students will have a committee meeting to discuss grant proposal that includes your mentor and all members of your committee in December or January of their second year. One week prior to this meeting you will submit your summary of specific aims (1-2 pages) to your mentor 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 mentor, the Chair of your committee, and typically one other member) by the date that is determined at the initial committee meeting. Typically, the due of draft submission has been by the end of March, but committee can be flexible on the date. It is recommended not to exceed due beyond the end of spring semester.

8. The Comprehensive Oral Examination **should be** scheduled before starting Fall semester of third year. We recognize that sometimes this might not be feasible, and the student/mentor may petition the MB Director of Graduate Studies to delay the orals exam based on unforeseen circumstances.

9. Upon successful completion of formal coursework and research, candidates present, for evaluation by a dissertation examination committee, a dissertation based on original research. The dissertation is presented and defended in a formal public lecture.

10. Students must complete the degree within seven years. Exceptions to this requirement requirea recommendation for extension of study by the Department's Graduate Director and Chairperson, and approval by Graduate Studies.

CORE CURRICULUM for ALL 1st Year Ph.D. 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)

CORE CURRICULUM for ALL 2nd Year Ph.D. STUDENTS

1. Research Grant Proposal Preparation" (**BIOL 925**) Or equivalent course approved by Director of Graduate Studies.

SPECIFIC COURSE REQUIREMENTS by DEGREE

Biochemistry and Biophysics Ph.D.

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 2nd 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 Advisory Committee may recommend that additional courses be taken.

Microbiology Ph.D.

Four 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 813	Advanced Bacterial Physiology
BIOL 814	Advanced Molecular Virology
BIOL 815	Advanced Molecular Genetics
And	
BIOL 925	Research Grant Proposal (fall of 2nd year)

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 Advisory Committee may recommend that additional courses be taken.

Molecular, Cellular and Developmental Biology Ph.D.

Along with BIOL 925 (fall of 2nd year), **three** graduate-level courses (numbered 600+) that total 9 credit hours. The following courses that satisfy these criteria are frequently offered (although others could also be acceptable - see the MB DGS):

BIOL 650	Advanced Neurobiology (**every** spring)
BIOL 680	Genomics **(every** fall)
BIOL 750	Advanced Biochemistry (spring of **odd** years)
BIOL 752	Advanced Cell Biology (fall of **even** years)
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 Graduate 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 Student seminar series (BIOL701, BIOL902, BIOL905).

RESEARCH PROPOSAL REQUIREMENT

Students must complete and submit a research proposal **at least three weeks prior** to the Comprehensive Oral Exam. 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 molecularbiosciences. The topic for the proposal will be determined by the Faculty Mentor, with input from the student and the graduate committee.

COMPREHENSIVE ORAL EXAMINATION

Once Ph.D. aspirants have successfully completed the required formal courses and research proposal requirement, the Comprehensive Oral Examination will be scheduled. **This examination should be held before starting fall semester of the third year of graduate study.** Exceptions to this deadline require a petition from the mentor that is approved by the student's Graduate Advisory Committee. The petition must explain the reason for the exception, and provide a schedule leading to a revised Oral examination date, which must be no later than December 30th unless strong reason support exception of the due. Your **Comprehensive Oral Exam Committee** will give the exam. You must 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 justificationof your preparedness for the exam or your absence of qualifications for admission to Ph.D. candidacy. After the exam and discussion of the Major Advisor's letter, committee members will decide whetheror not you passed, thus becoming a ***candidate*** for the Ph.D. degree. The Graduate Program Assistant will forward this decision to the College Office of Graduate Affairs.

IMPORTANT: The exam must be scheduled with the College Office of Graduate Affairs **at least three weeks before** the exam actually takes place. This means that, after receiving approval from your Major Advisor and Comprehensive Oral Exam Committee, you must notify the Graduate Program Assistant 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 Comprehensive Oral Exam 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, but ***no earlier than 3 months***, and ***no later than 6 months*** after the date of the first exam. ***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 Ph.D. program. In this case, there is a possibility that you could switch to the M.S. program.

FINAL ORAL DEFENSE of DISSERTATION

Once the Comprehensive Oral Exam has successfully been completed, you will form a **Ph.D. Dissertation Defense Committee**. This is usually the Comprehensive Oral Exam Committee plus the Faculty Mentor. This committee is responsible for giving you permission to begin writingthe 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 Ph.D. Dissertation Defense Committee, the Final Dissertation Defense is scheduled with the Graduate Program Coordinator. 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 ARTS DEGREE

The general mission of graduate education for M.A. 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, Ph.D.-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 M.A. 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 course-work 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 M.A. 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 M.A.

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 Student seminar series (CaMP: **BIOL 701** or AMCB: **BIOL902** or AMG: **BIOL 905**) every semesterbeginning second year.

4. Graduate Advisory Committee of 3 faculty members, including mentor, will meet at least once annually. The Annual Report Form, including signatures of committee members must be sent to the Graduate Program Assistant after each annual committee meeting. (Digital signatures or emails affirming support for the Report are sufficient). However, the mentor – supported by the graduate advisory committee – may request an exception to this rule. The petition from the mentor should explain the reason behind the exception and should schedule an annual committee meeting within 3 months.

5. A public defense of the master's thesis and examination by Graduate Advisory Committee.

6. Students must 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 M.A.

BIOL 750 Advanced Biochemistry
BIOL 772 Gene Expression
BIOL 807 Graduate Molecular Biosciences
BIOL 817 Rigor, Reproducibility and Responsible Conduct in Research
BIOL 899 Master's Thesis
BIOL 901 Graduate Seminar in Biochemistry (1 semester)

Microbiology M.A.

BIOL 807 Graduate Molecular Biosciences
BIOL 817 Rigor, Reproducibility and Responsible Conduct in Research
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 813 Advanced Bacterial Physiology
BIOL 814 Advanced Molecular Virology
BIOL 815 Advanced Molecular Genetics

Molecular, Cellular and Developmental Biology M.A.

BIOL 752 Cell Biology
BIOL 755 Mechanisms of Development
BIOL 807 Graduate Molecular Biosciences
BIOL 817 Rigor, Reproducibility and Responsible Conduct in Research
BIOL 899 Master's Thesis

And *one* of the following courses:
BIOL 650 Advanced Neurobiology (**every** spring)
BIOL 680 Genomics **(every** fall)
BIOL 757 Carcinogenesis & Cancer biology (spring of **odd** years)
BIOL 772 Gene Expression (spring of **odd** years)

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 M.A. Graduate Advisory Committee, the Final Oral Defense is scheduled with the Graduate Program Assistant. 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 M.A. program.

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