New Mexico State University

MOLECULAR BIOLOGY PROGRAM

New Mexico State University

Graduate Student Handbook

2015 - 2016

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A Student Guide to Graduate Studies in Molecular Biology

General Definitions

Admissions Policies

All students are admitted to the Molecular Biology Graduate Program on a competitive basis, with preference given to Ph.D. level students. Previous course records and GPA standings, GRE scores, letter of interest from the applicant, and letters of reference (plus TOEFL scores of foreign applicants) are weighed heavily during the selection process. Preference is given to candidates who have identified an NMSU advisor, and whose applications are supported by that advisor. The number of openings in any given semester or academic year normally is determined by the number of assistantship positions available to be awarded. Applicants are not admitted without a source of first-year financial support. Thus, there are cases where qualified applicants are rejected due to a lack of stipend support. Requests for transfer of major to Molecular Biology by students already accepted to the NMSU Graduate School under a different major will be considered after a review of the student's rationale for the transfer request, current academic standing, source of financial support, and consent of current advisor.

Foreign Student Requirements

In addition to attending the NMSU Graduate School Orientation Program for new students and/or the International Teaching Assistants Training Course, new foreign students must satisfy NMSU requirements for English language competency. This may entail enrollment in one or more speaking and writing courses.

Core Courses (All students are required to complete the following three Core Courses before the Qualifying Exam)

- MOLB / BIOL 520, Molecular Cell Biology
- MOLB / BCHE 545, Molecular and Biochemical Genetics
- MOLB / GENE 542, Biochemistry I.

OTHER REQUIRED COURSES BY ALL STUDENTS :

OTHER REQUIRED COURSES BY ALL STUDENTS :		
MOLB 590	DCSNS Molecular Biology (Brown Bag Seminar)	1 - 3 Credits
MOLB 597	Lab Rotation / Research Discussion	1 - 3 Credits
MOLB 599	6 Thesis Research Credits	6 Credits
E ST 505	Statistical Inference (science based program)	4 Credits
BIOL 540	Science and Ethics, or equivalent course	1 - 3 Credits

Recommended prerequisites, or their equivalents, for the Core Courses:

- *Prerequisite for MOLB 520 =*
    - *MOLB 542 Biochemistry I*
    - *or BCHE 395 Biochemistry*
- *Prerequisites for MOLB 542 =*
    - *CHEM 395 Biochemistry*
    - *or CHEM 314 Organic Chemistry*
- *Prerequisites to MOLB 545 =*
    - *BCHE 542 Biochemistry I*
    - *CHEM 396 Biochemistry and Biotechnology*
    - *AGRO 486 Intermediate Genetics*
    - *or BIOL 478 Molecular Biology of Microorganisms*
- *Ph.D. Candidates entering the program with prior background may have one or more of these courses waived by the student's committee with approval of the MOLB director.*

Tier II Courses

At least 9 credits are required of all students from the following list of courses:		
AGRO 486	Intermediate Genetics	3 Credits
AGRO /HORT /MOLB 506	Plant Genetics	3 Credits
AGRO 516	Molecular Analysis of Complex Traits	3 Credits
AGRO/HORT 531	Plant Physiology: Growth and Development	3 Credits
AGRO/ HORT/ MOLB 685	Plant Genetic Engineering	3 Credits
BCHE 494	Techniques in Genetic Engineering	4 Credits
BCHE 546 / MOLB 546	Biochemistry II	3 Credits
BCHE 645	Nucleic Acid Metabolism	3 Credits
BCHE 647	Graduate Physical Biochemistry	3 Credits
BCHE 648	Proteins and Enzymes	3 Credits
BIOL 474	Immunology	3 Credits
BIOL 475	Virology	3 Credits
BIOL 477	Applied and Environmental Microbiology	4 Credits
BIOL 478	Molecular Biology of Microorganisms (offered fall only)	3 Credits
BIOL 490	Neurobiology	3 Credits
BIOL 451	Physiology of Microorganisms	3 Credits
BIOL 520 / MOLB 520	Discussions in Molecular Biology	1 Credit
BIOL 523	Mechanisms of Microbial Pathogenicity	3 Credits
BIOL 540	Science and Ethics, or equivalent	1 - 3 Credits
BIOL 541	Professional Development Seminar	1 Credit
BIOL 541	Advanced Genetic Aspects of Population Biology	3 Credits
BIOL 550	Molecular Biology of Disease Vectors	3 Credits
BIOL 550	Genomics Techniques in Life Sciences -Dr. Xu	3 Credits
BIOL 550	Bioinformatics Applications & Databases - Dr. Xu	3 Credits
BIOL 591	Principles of Confocal Microscopy	1 Credit
BIOL 592	Microscopy Practicum	1 – 3 Credits

BIOL 482	Molecular Systematics	3 Credits
BIOL 577	Adv. Topics Environmental Microbiology	3 Credits
BIOL 590 / MOLB 590	Advanced Neurobiology - special topics	1 – 3 Credits
BIOL 698	Selected Topics	1 – 3 Credits
CHEM 516	Advanced Organic Chemistry I, Physical Organic Chemistry	3 Credits
CHEM 517	Advanced Organic Chemistry II, Synthetic Organic Chemistry	3 Credits
CHEM 546	Biochemistry II	3 Credits
EPWS 486	Plant Virology	3 Credits
MOLB 450	Special Topics in Molecular and Cellular Biology	1 - 3 Credits
MOLB 452	Independent Studies in Bioinformatics	1 - 3 Credits
MOLB 470	Genome Analysis and Bioinformatics, or equivalent	1 - 3 Credits
MOLB/AGRO/HORT 506	Plant Genetics	1 - 3 Credits
MOLB 520 / BIOL 520	Discussions in Molecular Biology	1 Credit
MOLB 530	Plant Physiology: Metabolism	3 Credits
MOLB 546 / BCHE 546	Biochemistry II	3 Credits
MOLB 550	Topics in Molecular Biology	1 - 3 Credits
MOLB 571	Molecular and Cellular Mycology	3 Credits
MOLB 590 / BIOL 590	Special Topics	1 - 3 Credits
MOLB 650	Advanced Topics in Molecular Biology	1 - 3 Credits
TOX 461	Toxicology I	3 Credits
WLSC 488	Principles of Conservation Genetics	3 Credits
MOLB 599 (6 Thesis Research Credits)		6 Credits

MS candidates must enroll for 6 credits of MOBL 599, Master's Thesis. **May register for additional credits to maintain full-tine status.**		6 Credits
Written Thesis		
Oral Thesis Defense		

Other Course Requirements and Competencies

In addition to the Core Courses and Tier II molecular biology courses requirements identified above, all students will take courses as recommended by the student's committee. All students are also expected to have competency in statistics equivalent to E ST 505, Statistical Inference, to have knowledge of computer software applications, and to complete the appropriate number of lab rotation and seminar courses as outlined in the section below.

Graduate Minors

The Molecular Biology Program offers formal graduate minors in Molecular Biology or Bioinformatics. A minimum grade of B is required in all courses to be counted toward the respective minor. At least one member of the student's graduate committee must be a faculty member approved as a Molecular Biology active participant (see Graduate Catalog listing of faculty under Molecular Biology).

Molecular Biology Minor consists of 10 credit hours including:

- *MOLB 545 Molecular and Biochemical Genetics, 3 credits*
- *MOLB 590 Research seminar, 1 credit*
- *MOLB 520 Molecular Cell Biology, 3 credits OR*
- *MOLB 542 Biochemistry I, 3 credits*
- *any Tier II course or Core Course, 3 credits*

Bioinformatics Minor --(Offered jointly with computer science)

Lab Rotations / Research Discussions (MOLB 597)

All entering students must enroll in MOLB 597, Lab Rotations/Research Discussions, for at least 1 credit in their first semester. All entering students are expected to introduce themselves to the MOBL faculty and continuing students upon their arrival. It is also important for the entering student to be exposed to research techniques and opportunities for research project areas, so they can identify specific research problem(s) suitable for development into their thesis or dissertation topic.

As a part of MOLB 597, entering students who have not yet identified and been accepted by a major advisor will be required to circulate through several (typically three) different labs working on assigned research techniques or problems. The labs identified for this rotation, and the student in consultation with the MOLB Director will determine the specific

number of credit hours. Nominally 1 credit hour represents a minimum effort of 4 hours/week of research activity. By the end of the semester, the student should have identified a major advisor and a thesis/dissertation topic.

Alternatively, entering students who already have identified and been accepted by a major advisor will consult with their major advisor to determine the manner in which MOLB 597 will be satisfied. Depending on the background of the student and the intended nature of the research topic, the major advisor may require (i) a lab rotation (typically through one to three labs), (ii) discussions of faculty research programs (typically with three to six faculty), (iii) an independent research problem in the major advisor's lab, or (iv) a combination of these activities. MOLB 597 is S/U graded.

Certification of Lab Rotations/Research Discussions

By the end of his/her first semester, it is the responsibility of each new student to submit to the Molecular Biology Program Office the completed. The form should be signed by the appropriate faculty members and student, and certified by the student's major advisor in order to obtain a grade for MOLB 597.

Advisor and Graduate Committee

Molecular Biology is a research-intensive discipline that requires a substantial commitment of time and financial resources. The pursuit of graduate study in Molecular Biology therefore requires a particularly strong and mutually respectful relationship between the graduate student and the faculty member who serves as the student's graduate advisor, and typically provides laboratory space and other resources to support the student's research work.

Incoming graduate students are expected to have identified one or more MOLB faculty members with whom they may be interested in working by the time they arrive on campus, and to meet and discuss their interests with relevant faculty once they arrive. During his or her first semester, each student will either select an advisor from among the MOLB faculty, or be assigned an interim advisor until they are able to make an informed selection. It is the student's responsibility to identify a member of the MOLB faculty willing to serve as his or her graduate advisor, and to obtain that faculty member's agreement to serve in an advisory capacity. Students must realize that the ability of a faculty member to serve in an advisory capacity may be limited by resources, laboratory space, or commitments to other students, and that agreement by a faculty member to serve as advisor involves a commitment by the student to perform research work in that faculty member's laboratory at an appropriate level of effort. Failure to identify and obtain the agreement of a MOLB faculty member willing to serve as advisor by the end of the first year in the MOLB program may result in dismissal from the program.

After the major advisor has been selected, the student in consultation with the major advisor should form a graduate committee. Please refer to the Graduate Catalog for complete guidelines and options for determining the composition of the graduate committee.

Typically, a master's candidate graduate committee will include a total of three members:

- *the major advisor (chair of the committee), a MOLB faculty member.*

- *one additional faculty member approved as a Molecular Biology active participant (see Graduate Catalog list of faculty under Molecular Biology or the MOLB Faculty Brochure)*

- *another graduate faculty member who is not a member of the Molecular Biology active participants list nor a member of the major advisor's home department (nominated as the Dean's Representative).*

If a minor is declared, at least one member of the graduate committee must represent the minor area (may also be the Dean's Representative if not from the home department of the major advisor), which in some cases will increase the size of the committee by one.

A doctoral candidate graduate committee typically includes a total of four members:

- *the major advisor (chair of the committee), a MOLB faculty member*
- *one or two additional faculty members approved as Molecular Biology active participants*
- *one faculty member representing the minor area or a related area of study when appropriate*
- *one graduate faculty member who is not a member of the Molecular Biology active participants list nor a member of the major advisor's home department (nominated as the Dean's Representative).*

Beginning with the second semester in the MOLB program, each graduate student is expected to meet with his or her committee at least twice per academic year to review progress toward the degree. The results of these committee meetings are to be reported to the MOLB Program Secretary no later than December 1 of each fall semester, and May 1 of each spring semester, using the Graduate Student Progress Evaluation Form. It is the student's responsibility to schedule these committee meetings and deliver the signed Graduate Student Progress Report Evaluation to the MOLB Program Secretary in a timely manner.

Laboratory Research

All Molecular Biology students are expected and required to carry out laboratory research in the laboratory of their advisor, or in a collaborating laboratory if specified by their advisor and committee. The Molecular Biology program does not offer a non-thesis degree option.

Molecular Biology is a hand-on science. All students are expected to develop competence in laboratory skills such as cloning and subcloning, creation of recombinant DNA constructs, nucleic acid and protein gel electrophoresis, Southern, Northern, and Western blots, quantitative nucleic acid and protein analysis, DNA sequencing and comparative sequence analysis, and gene expression analysis, and to achieve expert-level skill in the laboratory and computer methods required to complete their thesis or dissertation research.

Students supported by Research Assistantship or Fellowship funds are expected to devote at least 20 hours per week during the academic year and full time during the summer to research work. Students supported by Teaching Assistantships or other sources of funding, including their own resources, are expected to establish acceptable levels of research effort with their advisors.

All students are required to complete biosafety training in a timely manner as required by their advisors or by general NMSU regulations.

MOLB 590 Seminars (Brown Bag Discussions)

All students are expected to attend MOLB 590, Discussions in Molecular Biology, each semester of their enrollment. Students are expected to enroll in MOLB 590 approximately once each academic year. M.S. candidates must enroll in MOLB 590 for credit at least twice, and Ph.D. candidates at least three times for credit, during their degree programs. Degree candidates and MBP faculty will present seminars on their current research activities. The format for these seminars is informal, providing an introduction and background to the research problem, a statement of specific research objectives, a discussion of results obtained to date, and an outline of future steps required in the experimentation. The first 590 seminar given by a new student may summarize a previous research experience or present a thesis/dissertation research proposal. Audiovisual aids, to facilitate the communication and discussion, are expected. MOLB 590 is S/U graded.

Competency in Computer Software Applications

All students are expected to develop and maintain a personal web page linked to the MOLB home page. This web page will contain at minimum, a description of their research interests and a current CV. All students must also demonstrate acceptance in the use of relevant computer software.

One way in which to satisfy the competency requirement in computer software applications is to register for 1 credit hour in MOLB 595. This course is a self-paced tutorial in the use of computer software relevant to molecular, cellular and/or biochemical research. The tutorial will be supervised by the student's major advisor, and the content of the tutorial may vary and must be approved by the student's graduate committee. MOLB 595 is graded S/U. A second option is to enroll in MOLB 452, which offers independent studies in bioinformatics under faculty supervision. A third option is to enroll in MOLB 470, which offers both lecture and computer laboratory materials related to bioinformatics and genome analysis. Other courses may be acceptable to the graduate committee upon petition. Finally, the thesis or dissertation research may entail a sufficient level of computational activity to warrant graduate committee approval for the computer software applications competency requirement.

Topics (MOLB 550) and Advanced Topics (MOLB 650) in Molecular Biology, and Special Topics in Molecular and Cellular Biology (MOLB 450)

Courses that are not taught on a regular basis, or special courses or lecture series offered on a one-time only basis, will be offered under MOLB 450 (for undergraduate and master's degree students), MOLB 550 (for master's degree students) or MOLB 650 (for Ph.D. degree students). When appropriate and approved by the student's committee and the MBP director, these courses may be considered for substitution for a "Tier II Course" requirement. Return to Student Guide Table of Contents

Individualized Research Credits (MOLB 598 and MOLB 698)

MOLB 598, Special Research Programs, may be used by continuing students for individual investigations, experimental or theoretical, as approved by the student's committee and a sponsoring MBP faculty instructor. MOLB 598 work will be letter graded, and a written summary must document the work performed for MOLB 598 credit. In addition MOLB 698, Advanced Research Projects, may be used for individualized special research assignments by continuing doctoral students with approval of the student's committee and a sponsoring MBP faculty instructor. MOLB 698 will be S/U graded.

Criteria for Milestones and Examinations for the Degree: Master of Science

Minimum Grades and Credit Hours

Each undergraduate deficiency course (see form No. 3 in the back of this Guide) and each Core Course must be passed with a minimum grade of B. An overall grade point average of 3.0 minimum must be maintained. M.S. candidates can expect to earn a degree with a minimum of 30 credits, including 6 credits of thesis research and 21 credits in course work as follows: 9 credits, "Core Courses"; 9 credits, "Tier II Courses"; 1 credit, MOLB 597 Lab Rotation; 2 credits, MOLB 590 Brown Bag Seminars; other credits as recommended by the student's committee. There is no non-thesis option currently offered in Molecular Biology for majors.

Core Courses Completion and Course Plan: M.S.

There is no Core Examination for M.S. candidates. However, upon successful completion of the core courses, the student will convene his/her committee for approval of the "Application for Admission to Candidacy for Master's Degree" form (No. 5 in the back of this Guide) with the course plan and proposed thesis title.

Thesis Proposals

The thesis proposal will be developed in conjunction with the student's major advisor. It will include a thorough review of the relevant literature, a statement of goals and specific objectives, an outline of the experimental plan for accomplishing the stated objectives, and a complete list of references. The proposal will be used as a guide for the thesis research and the content may be modified as needed with the approval of the major advisor. The final version will be typed, double-spaced. Committee review and approval of the proposal is intended to assure that the scope and nature of the research is meritorious of a thesis when completed. The proposal must be rewritten as frequently as deemed necessary to meet the satisfaction of the major advisor and the committee with respect both to content and to readability and clarity in the use of the English language. The student is then encouraged to use the proposal as a first draft of the thesis itself, and to add sections on materials and methods, results, and discussion as each major experiment is performed and completed.

MOLB 599 (Thesis Research Credits)

All M.S. candidates must enroll for at least 6 credits of MOLB 599, Master's Thesis. Only 6 credits of MOLB 599 may be counted toward official degree credit, but the student may register for additional credits to maintain full-time status. This research activity is directly related to the thesis.

Thesis Formats

The Graduate School has rigorous requirements for the thesis format, which must be followed. A thesis may include chapters based on previously published or in press journal articles generated from the thesis research, in conformance with the guidelines described elsewhere in this Guide for dissertation formats; but this event is not frequent. A thesis may be submitted in a form suitable for submission to a journal, as long as the Graduate School requirements are satisfied. See the Graduate School publication, "Guidelines for Preparing a Thesis or Dissertation."

Final Examination: M.S.

Please be aware of the deadlines for final exams, etc. for graduation as published by the Graduate School. The final examination is immediately preceded by a public 30- to 45-minute seminar summarizing the thesis research. The committee is then convened for a rigorous oral defense of the thesis. The defense of the thesis may lead to additional questions in regard to the student's disciplinary knowledge base, but this is not a requisite of the exam. In special cases, this exam may also serve as the qualifying/core examination for the Ph.D. degree with pre-approval of the committee and the MBP director. The Graduate School form to schedule the final exam must be filed at least 10 working days in advance. Upon successful completion of the final exam, the MBP director should sign the Graduate School clearance card as department head. In most cases, the home department of your major advisor will also want a copy of your thesis for their departmental library. Please check with the department head of your major advisor's department to verify they want a departmental copy, and if so, the home department should reimburse you for the additional costs of the fourth copy (please verify in advance). In these cases, the student should submit four (4) signed copies of the thesis to the library, rather than the three copies indicated by the Graduate School. (The required first three copies are distributed to Molecular Biology Program, Graduate School, and NMSU Library.)

Molecular Biology Degree Plan Checklist* Master of Science Degree Candidates

Before, or at Start of First Semester

- sign paperwork for receiving financial support through teaching (TA) or research (RA) assistantship (if applicable)
- attend NMSU Graduate School Orientation Program for new students
- register for courses after consulting with Molecular Biology Program (MBP) Director and/or major advisor
- receive teaching assignment (for TA's)

First Semester

- initiate formal course work
- attend Molecular Biology brown bag discussion meetings (MOLB 590) on Mondays at noon
- rotate through several laboratories of professors for research orientation (MOLB 597; labs are your choice after consultation with the MBP Director and/or major advisor) and submit form upon completion.
- choose a faculty major advisor (if not already identified)

Second Semester

- continue course work and brown bag discussions
- initiate independent research with guidance of major advisor
- submit draft(s) of written thesis proposal to major advisor; revise as needed
- with your major advisor, form a master's committee
- meet with committee to discuss thesis proposal; file committee report with MOLB secretary

First Summer

- following completion of core courses, file "Application for Admission to Candidacy for Master's Degree" form with committee approval
- carry on independent research work full time

Third Semester

- continue course work
- present first MOLB 590 seminar
- continue independent research work
- obtain committee approval of thesis proposal

Fourth Semester

- complete formal course work
- present second MOLB 590 seminar
- complete research and start writing thesis
- meet with committee

Second Summer (or Last Semester)

- file "Application for Diploma"
- complete writing of thesis and any last-minute experiments
- present 30- to 45-minute public seminar as part of thesis defense
- defend thesis in Final Exam; paperwork due in Graduate School 10 working days in advance

*This timetable is idealized for those students entering the program in the Fall semester. Certain examination schedules and other milestones may need to be adjusted for those students entering in the Spring semester or Summer.

Criteria for Milestones and Examinations for the Degree: Doctor of Philosophy

Minimum Grades and Credit Hours

Each undergraduate deficiency course, and each core course, must be passed with a minimum grade of B. An overall grade point average of 3.0 minimum must be maintained. Ph.D. candidates entering the program with a master's degree in a related field can expect to earn a degree with a minimum of 26 credits in course work as outlined below, plus a minimum of 18 credits of dissertation research, for a total minimum of 44 credits; additional course work may be required as determined by the student's committee.

Except where specific waivers are granted (for example, to by-pass a core course), the required 26 credits in course work consists of: 12 credits, "Core Courses"; 9 credits, "Tier II Courses"; 1 credit, MOLB 597 Lab Rotation; 3 credits, MOLB 590 Brown Bag Seminars; 1 credit, specialized literature seminar in a relevant department. Ph.D. candidates entering the program without a master's degree in a related field can expect to be required to earn additional credits in course work beyond these requirements, with a total minimum of 75 credits in graduate study beyond the bachelor's degree being typical.

Qualifying/Core Examination: Ph.D.

The purpose of the Qualifying/Core Examination is to determine the adequacy of a student for Ph.D. work, and it is required of all Ph.D. students in the program. This examination serves as the Qualifying Exam as described in the Graduate Catalog.

Within three months after a student has successfully completed the three core courses in the program, or by the end of the first 12 months in the program, which ever comes first, an oral Qualifying/Core Examination will be scheduled. The student's dissertation committee will administer the examination. The dissertation committee should be selected by the student in conjunction with his/her major advisor to include members that can complement and help the student with his/her proposed research topic, and who can address various aspects of the core courses (the three core course instructors should not be on every committee).

The examination will be based on a short document of about three pages in length written by the student outlining his or her chosen research topic. The document will include 7-10 citations with no more than 3 review articles. It is expected that the primary literature cited will represent the seminal articles related to the research project. It is expected that the

document and the citations therein will have been reviewed and approved by the major advisor prior to distribution to the committee. The document should be in the hands of the committee at least five working days before the examination. This document will constitute the written portion of the Qualifying/Core Examination. The student should be prepared to discuss, explain and defend his/her project and all cited material in the oral exam.

The Qualifying/Core Examination is intended to serve as a basis for integrating and synthesizing information from the core courses into the rationale and/or experimental designs of the written research outline. However, Qualifying/Core Examination questions do not have to be limited to the written outline. The student must defend the ideas presented in the written outline as well as respond in a satisfactory manner to other questions raised during the oral exam.

In determining the outcome of the Qualifying/Core Examination, the committee will discuss and consider performance on the oral exam as well as transcripts, grades and performance in all courses taken to date at NMSU, and the recommendation of the major advisor regarding the student's potential at the lab bench. All available information regarding the student's performance and capabilities may be considered.

The student's committee will record the final outcome of the Qualifying/Core Examination and file it in the Molecular Biology office. Following successful completion of the Qualifying/Core Examination, the student submits for committee approval the "Program of Study and Committee for Graduate Students Pursuing the Doctorate" form, and the written portion of the exam should be used by the student as a basis for developing a full-length dissertation proposal for continuing review by their major advisor and dissertation committee. However, as noted above, the candidate may not go forward without successfully completing the three core courses (MOLB 542, MOLB 520, and MOLB 545).

The possible outcomes of the Qualifying/Core Examination will be:

Student is admitted to further work towards the doctorate

Recommend student limit his/her program to the master's degree; the Qualifying/Core Examination can be retaken as part of the M.S. defense

Recommend student discontinue graduate work

Dissertation Proposals

The dissertation proposal will be developed in conjunction with the student's major advisor and committee members, but should include significant independent analysis and planning by the student. It will include a thorough and critical review

of the relevant literature, a statement of goals and specific objectives, an extensive outline of the experimental plan for accomplishing the stated objectives including some details of the procedures and approaches to be used, and a complete list of references. The proposal will be used as a guide for the dissertation research, with significant changes in content to be approved by the student's committee. The final version will be typed, double-spaced. Committee review and approval of the proposal is intended to assure that the scope and nature of the research represents a significant and novel contribution to science, meritorious of a dissertation when completed. The proposal must be rewritten as frequently as deemed necessary to meet the satisfaction of the major advisor and the committee with respect both to content and to readability and clarity in the use of the English language. The student is then encouraged to use the proposal as a first draft of the dissertation itself, and to add sections on materials and methods, results, and discussion as each major experiment is performed and completed.

Comprehensive Examination: Ph.D.

The comprehensive examination consists of two parts. The first part is a written research grant proposal, which may or may not be related to the topic of the student's dissertation research at the direction of the student's committee. The second part is an oral defense of the written research grant proposal and relevant disciplinary knowledge.

The written research grant proposal must conform to the current guidelines for NIH, NSF, or USDA competitive grant proposals regarding a Statement of Work (excluding ancillary legalese forms, budgets, etc.) and should not exceed 15 typed, single-spaced pages excluding references. The work proposed should be reasonable for an expected three-year grant duration. The student may verbally discuss ideas for a grant proposal with student peers and committee members. However, the concepts, approach and execution proposed should fundamentally originate with the student. The major advisor may review a draft for readability and clarity but may in no way assist in the actual writing of the grant proposal, and in no other way may the grant proposal be circulated until it is submitted to the committee. Once submitted to the committee, the committee members have seven working days to respond verbally to the major advisor whether the written grant proposal is ready to be examined or is deficient. Comments justifying a deficiency vote will be communicated, without identity of source, to the student by the major advisor. Two or more votes of deficiency will return the grant proposal to the student for a rewrite, which must be resubmitted to the committee within 10 working days. A maximum of two rewrites is permitted. Once the committee determines that the written grant proposal is ready to be examined, the oral portion of the comprehensive exam may be scheduled. The Graduate School form to schedule the oral portion of the comprehensive exam (No. 8 in the back of this Guide) must be filed at least 10 working days in advance.

The oral portion of the comprehensive examination will include rigorous defenses of the written research grant proposal, and of the disciplinary knowledge relevant to the student's program of study including ability to use those knowledge

bases in a manner befitting a molecular biologist at the doctorate level. Thus, this portion of the exam is scheduled after all or the majority of the formal course work has been completed. At the end of the oral portion of the exam, a single vote is cast by each committee member regarding the student's performance on both the written and oral portions of the comprehensive. The vote is for pass, fail, or adjourn. Two or more votes for adjourn will require the oral portion of the exam to be rescheduled within 15 working days (3 weeks); the committee may also require a rewrite of the written portion of the exam. Two or more votes for fail will require the committee to determine whether the student is disqualified from the comprehensive exam for the lapse of one semester, or disqualified from the Ph.D. degree program.

MOLB 600 and MOLB 700 (Doctoral Research Credits)

All Ph.D. candidates are required to enroll for at least 18 credits of MOLB 700, Doctoral Dissertation Research, normally following successful completion of the comprehensive exam. Only 18 credits of MOLB 700 may be counted toward official degree credit, but the student may register for additional credits to maintain full-time status. This research activity is directly related to the dissertation. Before completion of the comprehensive exam, doctoral students should enroll in MOLB 600, Molecular Biology Research, for research activity related to the dissertation; however, MOLB 600 credits may not be counted toward formal course work requirements unless so approved by the committee and the MBP director.

Dissertation Formats

The Graduate School has rigorous requirements for the dissertation format, which must be followed. See the Graduate School publication, "Guidelines for Preparing a Thesis or Dissertation." While the dissertation is authored only by the individual Ph.D. candidate, productive Ph.D. candidates frequently have already published or in press journal articles resulting from the dissertation research, and these articles often have more than one author. In this event, the articles should include a footnote indicating that the research was performed in part for the dissertation. When the student is the senior author on an article, it may be included as a chapter in the dissertation provided that the student was in fact the primary scientist and drafted (authored) the article. When the student is the junior author on an article, or was not the primary scientist, or did not draft the article, the article may not be a chapter in the dissertation unless: (1) the student extracts the portion of work on which he/she was the primary scientist and redrafts (authors) the text; or (2) the student made significant contributions to the entire work reported and redrafts (authors) the entire text. There may be other special situations not covered here that will require a recommendation from the student's committee and approval of the MBP director. If such articles are used in the dissertation as chapters, the acknowledgments section should clearly identify that work presented which was not the student's own. When chapters are used, the dissertation must include a general introduction for the whole body of work, and a general discussion that interrelates the entire body of work as a coherent whole.

Final Examination: Ph.D.

Please be aware of the deadlines for final exams, etc. for graduation as published by the Graduate School. The final examination is immediately preceded by a public 45-minute seminar summarizing the dissertation research. The committee is then convened for a rigorous oral defense of the dissertation, which is open to the public. The defense of the dissertation may lead to additional questions in regard to the student's disciplinary knowledge bases, but this is not a requisite of the exam. The Graduate School form to schedule this exam must be filed at least 10 working days in advance. Upon successful completion of the final exam, the MBP director should sign the Graduate School clearance card as department head. In most cases, the home department of your major advisor will also want a copy of your thesis for their departmental library. Please check with the department head of your major advisor's department to verify they want a departmental copy, and if so, the home department should reimburse you for the additional costs of the fourth copy (please verify in advance). In these cases, the student should submit four (4) copies of the signed dissertation to the library, rather than the three copies indicated by the Graduate School. (The required first three copies are distributed to Molecular Biology Program, Graduate School, and NMSU Library.)

A Student Guide to Graduate Studies in Molecular Biology

Molecular Biology Degree Plan Checklist * Ph.D. Degree Candidates

Before or at Start of First Semester

- *sign paperwork for receiving financial support through teaching (TA) or research (RA) assistantship (if applicable)*
- *attend NMSU Graduate School Orientation Program for new students*
- *register for courses after consulting with Molecular Biology Program (MBP) Director and/or major advisor*
- *receive teaching assignment (for TA's)*

First Semester

- *initiate formal course work*
- *attend Molecular Biology brownbag discussion meetings (MOLB 590) on Mondays at noon*
- *rotate through several laboratories of professors for research orientation (MOLB 597; labs are your choice after consultation with the MBP Director and/or major advisor) and submit form upon completion*
- *choose a faculty major advisor (if not already identified)*

Second Semester

- *continue course work and brownbag discussions*
- *initiate independent research with guidance of major advisor*
- *submit draft(s) of written dissertation proposal to major advisor; revise as needed*
- *with your major advisor, form a doctoral committee*
- *meet with committee*

First Summer

- *take Qualifying/Core Exam following completion of core courses and file results using appropriate form*
- *file "Program of Study and Committee for Graduate Students Pursuing the Doctorate" form after Qualifying/Core Exam and committee approval*
- *carry on independent research work full time*

Third Semester

- *continue course work*
- *present first MOLB 590 seminar*
- *continue independent research work*
- *submit dissertation proposal to committee for approval*

Fourth Semester

- *complete most of formal course work*
- *present second MOLB 590 seminar*
- *continue independent research work*
- *discuss ideas with your committee and peers and prepare to write "research grant proposal" for Comprehensive Exam*

Second Summer

- *continue doctoral research*
- *begin writing "research grant proposal" for Comprehensive Exam*

Fifth Semester *through the* **O Next-to-Last Semester**

- *take ancillary course(s) of interest*
- *give third MOLB 590 seminar*
- *meet annually with committee to review research progress*
- *complete the writing of "research grant proposal" for Comprehensive Exam and present to committee*
- *schedule and take oral portion of Comprehensive Exam upon committee recommendation that "research grant*

proposal" is ready to be examined; paperwork due in Graduate School 10 working days in advance

- *present MOLB 690 seminar (preferably not in same semester as third MOLB 590)*
- *continue doctoral research (MOLB 700 - minimum of 18 credits following completion of Comprehensive Exam)*
- *obtain committee approval to write dissertation (sufficient novel results have been generated) and start writing*

Last Semester

- *file "Application for Diploma"*
- *complete writing of dissertation*
- *give 45-minute public seminar as part of dissertation defense*
- *defend dissertation in Final Exam; paperwork due in Graduate School 10 working days in advance*
-

*This timetable is idealized for those students entering the program in the Fall semester. Certain examination schedules and other milestones may need to be adjusted for those students entering in the Spring semester or Summer. In addition, it should be understood that Ph.D. candidates entering with an M.S. degree may be able to accelerate their timetables, while Ph.D. candidates entering without an M.S. degree may need to extend their timetables.

P.O. Box 30001
Las Cruces, NM 88003-8001
TEL (505) 646-3437

Graduate Student Progress Evaluation Form

'his form documents the date, attendance, and conclusions of the annual committee ıeeting required of every graduate student in the NMSU Molecular Biology Program.

'his form must be submitted to the MOLB secretary with all required signatures not later than **uly 15th** of each year. Failure to submit a completed form will result in inability to progress to ıe next semester.

ıraduate Student: _____

)egree Program (MS or PhD): _____

ıdvisor: _____

)ate of Committee Meeting: _____

:ommittee Members Present: _____

'arget Program Completion Semester: _____

:urrent Student Support: _____

'lanned Next Semester Support: _____

'rogress Toward Degree is: _____ Satisfactory, or _____ Unsatisfactory.

ıecommended Actions: _____

_____

_____
(Signed) Advisor

ıignatures required of all Committee Members: _____
(Signed) Committee Member

_____
(Signed) Committee Member

_____
ıigned) Committee Member

_____
(Signed) Committee Member

CERTIFICATION OF MOLB 597 LAB ROTATION/RESEARCH DISCUSSIONS WITH MOLECULAR BIOLOGY FACULTY
(Must be submitted to MOLB Office before the end of first semester at NMSU for MOLB 597 grade)

This is to confirm that the total number _____ of faculty signatures required is pre-approved by:

_____ _____
MBP Director of Major Advisor Date

Name of student: _____ has completed a rotation in my laboratory:

_____ _____
Faculty signature Date

_____ _____
Faculty signature Date

_____ _____
Faculty signature Date

or has discussed research interest with me:

_____	_____	_____	_____
Faculty signature	Date	Faculty signature	Date
_____	_____	_____	_____
Faculty signature	Date	Faculty signature	Date
_____	_____	_____	_____
Faculty signature	Date	Faculty signature	Date

Submitted: _____ _____

I agreed to serve as major advisor for this student and I attest that the requirements for MOLB 597 have been satisfied:

_____ _____
Major Advisor **Date**

Graduate Student Forms

Master's Students

Master's Final Examination

Program of Study and Committee for Master's Students (Application for Admission to Candidacy)

Doctoral Students

Dissertation Title Submission

Doctoral Qualifying Examination

Program of Study and Committee for Doctoral Students