COMPARATIVE BIOMEDICAL SCIENCE
(CBSC Code: VMSC)
GRADUATE PROGRAM HANDBOOK

(Note: The Graduate School Policies supersede this policy
https://academiccatalog.umd.edu/graduate/policies/)

DEPARTMENT OF VETERINARY MEDICINE

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

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GRADUATE STUDIES IN CBSC, University of Maryland

Comparative Biomedical Science Graduate Program Overview

The Department of Veterinary Medicine directs the graduate program in Comparative Biomedical Science (**program code: VMSC**). The program's faculty members provide training in a wide variety of Biomedical Science-related disciplines, including virology, bacteriology, parasitology, immunology, epidemiology, pathology, and vaccinology. The program offers graduate study leading to the Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees.

The objectives of the CBSC Graduate Program are as follows:

1. Train students to be professional scholars and leaders of Comparative Biomedical Science in academic, government, and relevant biotech-based industries.
2. Advance knowledge and technology in Comparative Biomedical Science critical to improving the health of humans, animals, and the environment.
3. Provide students with the skills in designing scientific research, analyzing and interpreting data, publishing research findings, and presenting data to scientific and public audiences.

The Department aspires to strengthen its position as a national and international leader in CBSC graduate training. The CBSC Graduate Program aims to establish a program focused on zoonotic infectious diseases in the academic fields of veterinary medical, biomedical, and comparative medical sciences. The program advances graduate training and research at all levels of organization from the molecular level, to the whole animals, to food animal production industry systems.

Facilities and Special Resources

The Avrum Gudelsky Veterinary Center at College Park is the home of the Department of Veterinary Medicine, University of Maryland, and the Maryland Campus of the Virginia-Maryland College of Veterinary Medicine (VMCVM). The Veterinary Center lies in the heart of Washington D.C./Maryland/Virginia thriving biotechnology community and is near to Maryland's major university research campuses and government laboratories, including the USDA Beltsville Agriculture Research Center, the National Institutes of Health (NIH), Food and Drug Administration (FDA), and Walter Reed National Military Medical Center.

The Avrum Gudelsky Veterinary Center contains 32,000 square feet of research and support laboratories, including extensive elevated biosafety animal care facilities. Over 10,000 square-foot research laboratories are fully equipped with state-of-the-art facilities for research on cell biology, molecular biology, microbiology, virology, and immunology, including cell culture facilities, ZEISS LSM 800 confocal microscope, fluorescence-activated cell sorter, flow cytometer, the Illumina MiSeq System for next-generation sequencing, fluorescence microscopes, ELISpot/Fluorospot Reader, Luminex, and a sophisticated electron microscope suite. Approximately 18,000 square feet of space comprises Biological Safety Level (BSL) 2 and BSL-

3+ facilities and ABSL2 and ABSL3 suites for laboratory animals. The poultry unit has 15 rooms, each equipped with 20 poultry isolators to contain infectious pathogens. The animal facility has a fully equipped necropsy room designed for postmortem analysis.

The Laboratory for Biological Ultrastructure in the Department of Biology is equipped with a transmission and scanning electron microscope, a confocal microscope, ultramicrotomes, and equipment for freeze-fracture studies. The Department of Cell Biology and Molecular Genetics maintains imaging core, genomics core, flow cytometry, and proteomics core. The Fischell Department of Bioengineering maintains the BioWorkshop in A. James Clark Hall at the University of Maryland, which offers access to an array of cutting-edge scientific instruments spanning from biological imaging, cellular and biochemical analysis to biomaterial characterization, and histology. The Institute of Bioscience and Biotechnology hosts Cryo-EM and protein X-ray crystallography. The University of Maryland has the Department of Laboratory Animal Resources (DLAR), a support unit for animal-based research and teaching. Extensive library facilities are available on campus. In addition, the College Park campus is close to the National Agricultural Library (NAL), the National Library of Medicine (NLM), the Library of Congress, and the National Archives, along with several other libraries of biomedical research and academic institutes, within a few mile range.

Computer facilities at the University of Maryland are outstanding. The department provides computer access to all faculty and graduate students. Students are provided with email accounts and free internet access. The campus maintains both Unix and mainframe systems and access to supercomputers for specific research projects. Software for graphics, modeling, statistics, and the analysis of molecular data is readily available.

The University of Maryland is located inside the Washington D.C. beltway and is also situated near several federal agencies involved in biomedical sciences. Collaborative initiatives are underway with the U.S. Food and Drug Administration's Centers for Veterinary Medicine (CVM) and Food Safety and Applied Nutrition (CFSAN); U.S. Department of Agriculture's Animal and Plant Health Inspection Services (APHIS), Food Safety and Inspection Service (FSIS), Agricultural Research Service (ARS), and Beltsville Agriculture Research Service (BARC); National Institutes of Health (NIH); Walter Reed National Military Medical Center; World Bank; and Pan American Health Organization (PAHO). Scientists from some of these agencies have adjunct appointments with the university and participate in student graduate committees.

Admission to the CBSC Graduate Program

Admission to the CBSC program requires a baccalaureate degree or equivalent from an accredited college or university in the United States or the equivalent in a foreign country. Applicants are required to have a minimum B average (3.0 GPA on a 4.0 scale) for all undergraduate courses. Applicants shall have at least 16 credit hours of prior course work in science and mathematics that includes calculus, physics, organic chemistry, biochemistry, biology, microbiology, genetics, statistics, or similar courses. Students lacking this general preparation may be provisionally admitted to the program and are required to correct coursework deficiencies within one year of enrollment. Graduate Record Examination (GRE) General Test is optional but highly encouraged. International applicants must demonstrate proficiency in English. A minimum computer-based

TOEFL score of 96, or IELTS (paper) score of 7, or a Pearson (PTE) score of 68 is required for admission. International applicants who are awarded a degree from an accredited institution in the U.S. or a nationally recognized university in one of the English speaking countries are not required to submit TOEFL or IELTS score for admission in the CBSC Graduate Program. Please refer to the Graduate School's website regarding English proficiency requirements and exemptions:

Prospective students must submit resume/CV, academic transcripts, GRE scores if available, English proficiency scores if applicable, letters of recommendation, statement of research goals and experience, and published work if applicable. Letters of recommendation must be from persons competent to judge the applicant's probable success in graduate school. These letters are usually from the applicant's former professors, who can give an in-depth evaluation of the applicant's strengths and weaknesses concerning academic achievement. Additional recommendations may come from employers or supervisors who are familiar with the applicant's work experience.

CBSC Graduate Admission and Examination Review Committee review applications and credentials and make admission recommendations to the Graduate School Dean. In cases where credentials were earned abroad, the Office of International Student and Scholar Services is consulted. The Graduate Admission and Examination Review Committee, chaired by the program's Director, reviews all applications submitted to the CBSC Graduate Program. The committee will assess the credentials of each applicant and determine if the applicant is acceptable for full admission, acceptable for provisional admission, or unacceptable for admission. The interview will be conducted by the admission committee and the interested faculty member for selected candidates. For applicants acceptable for provisional admission, the committee will determine the deficiencies or requirements that the student must meet upon subsequent enrollment. The Graduate Admission and Examination Review Committee Chair will inform the faculty of the recommendations of the committee and identify potential faculty to serve as Advisor. The Advisor must be a member of the Graduate Faculty in or affiliated with the Veterinary Medicine Department. Admission is dependent on the availability of a faculty member in the proposed area of study who is willing to assume the responsibility of the Advisor and the availability of funding. Once a suitable Advisor is identified, the Graduate Admission and Examination Review Committee Chair notifies the Graduate School of the Department's recommendation on admission status. Only the Graduate School can issue an official offer of admission.

Graduate Assistantship

Graduate teaching and research assistantships will be provided on a competitive basis in the Department of Veterinary Medicine or other academic units where our affiliated faculty members are located. Graduate assistants spend approximately 20 hours per week, assisting with teaching or research activities. The remainder of their time is generally occupied by coursework and thesis/dissertation research. Appointments to research and teaching assistantships are for 12 and 10 months, respectively. The Department of Veterinary Medicine or other academic units where our affiliated faculty members are located, however, will cover the summer salary of all teaching assistants.

Specific Responsibilities of the Advisor and Advisory Committee

1. As soon as possible after admission to the CBSC Graduate Program, the graduate student shall contact his/her Faculty Advisor to begin discussions regarding the plan of study (form in Appendix I) and research direction.
2. The graduate student in consultation with the Advisor is responsible for appointing an Advisory Thesis Committee. For Master of Science candidates, this committee shall consist of at least three faculty members. At least two must be Full or Regular members of the Graduate Faculty. For Ph.D. students, the Advisory committee must consist of at least five faculty members: three must be Full or Regular members of the Graduate Faculty. A faculty advisor for a doctoral student must be a Full or Regular member of the Graduate Faculty. One member of the Advisory Committee must be qualified to serve as the Dean's Representative in the Doctoral Dissertation Examination. The Dean's Representative must be a regular graduate faculty member whose tenure home is not Vet Med and his/her research interests match with those of the research proposed by the student. It is the responsibility of the Dean's Representative to assure the integrity of the process and to ensure that Graduate School policies are observed. The names of the advisory committee must be submitted to the Graduate Admission and Examination Review Committee Chair by the end of the second semester (for M.S. students) or the fourth semester (for Ph.D. students) in the program. Upon approval by the Graduate Admission and Examination Review Committee, it is the responsibility of the advisory committee to guide the student through the remainder of the graduate program. Appointments must comply with the Graduate School requirement for the composition of an examining committee.
3. Students must convene a meeting of the Advisory Committee to report on their progress and accomplishments. The student shall prepare a report in writing and shall include any materials as requested by his/her Advisory Committee in a previous committee meeting and distribute this report to the Advisory Committee members at least five business days before the Advisory Committee Meeting. The Chair of the committee must provide a written report of the committee's views and recommendations to the Graduate Admission and Examination Review Committee Chair. If only one Advisory Committee Meeting is held in a year, this report can also serve as the annual progress and accomplishment report. If multiple meetings are held, a summary report is needed to serve as the annual progress accomplishment report.
4. The student must submit a written research proposal to his/her Advisory Committee. The research proposal shall be submitted to the Advisory Committee Chair by the end of the second semester of study for M.S. students and the end of the fourth semester for Ph.D. students. If the thesis or dissertation research involves the use of vertebrate animals, the campus Institutional Animal Care and Use Committee (IACUC) must approve animal use protocols. If the research involves the use of human subjects, the campus Institutional Review Board (IRB) must approve the research. Research that involves hazardous materials (biological and chemical) or recombinant RNA/DNA must be approved by the Institutional Biosafety Committee (IBC). It is the responsibility of the students and their Advisor to obtain the appropriate approvals before conducting research.

Responsible Conduct of Research

All students are required to take a Bioethics course during their time in the Biological Sciences Graduate Program. This course is usually taken during the student's first year in the program. This can be via an approved workshop or online course. More information (including the full University of Maryland policy) on RCR training and workshops and programs approved for this training can be found on the University research website.

Campus and Federal requirements stipulate that any research project using animals or humans must be approved by the appropriate Campus committees before the initiation of research. This applies not only to research being conducted on campus but also to all research conducted by UMD faculty or students at other sites around the world. **Research conducted off-campus, even if covered by an approved protocol at the off-campus site, must also be approved by our campus committees. Students should discuss approvals with their on-campus advisors before beginning research.**

Research in Progress Seminars (RIPS)

All students in the CBSC Graduate Program are required to give a Research in Progress seminar every two years, starting the second year. These short 25-minute talks with 5-minutes for questions, typically report research results. It is expected that the talk follows the typical scientific presentation format (background, method, results, and conclusions). RIPS are presented to an audience consisting of faculty, graduate students and undergraduate students, and postdoctoral scholars. RIPS is presented in the departmental seminar series.

Review of Student Progress and Accomplishments

The progress of every student will be evaluated at the end of each spring semester. The students in the program are required to maintain a GPA of 3.0. Those who have a GPA below 3.0 will be placed at probation status and have one more semester to make up. Those who fail to makeup it may face dismissal. The Advisor, in consultation with the student and the Advisory Committee, is required to submit an Annual Progress and Accomplishment Evaluation to the Chair of the Graduate Admission and Examination Review Committee. Both the Advisor and Student must sign this evaluation. Each student's progress will be reviewed by the Graduate Admissions and Examination Review Committee between the spring and fall semesters. Factors considered in the review include the Annual Progress Evaluation report, cumulative grade point average in graduate-level courses, completion of deficiencies or remedial coursework, completion of requirements specified by the Advisor or Advisory Committee, and progress towards appropriate program benchmarks (the plan of study, research proposal, and candidacy examination). Upon completion of the review, the Graduate Admissions and Examination Review Committee Chair will consult with the Advisor and may make the following recommendations to the Department Chair:

1. Retention—for students who are making satisfactory progress
2. Probation—for students who are not making satisfactory progress
3. Dismissal—for students who are not making satisfactory progress and have not fulfilled the Program requirements for retention.

The Graduate Admissions and Examination Review Committee Chair will notify the students in writing of their status. For students recommended for Probation, the Graduate Admissions and Examination Review Committee, in conjunction with the Advisor, will specify the conditions required for retention. Students will then have one year to satisfy these requirements. Students may

appeal probation and dismissal recommendations in writing within ten working days of receipt of the recommendation to the Chair of the Department.

Mediation, Conflict Resolutions, and Appeals

Students experiencing conflict with their Advisor, committee members, other faculty, or with lab members should discuss their concerns with their Advisor and CBSC Director as soon as possible. Conflicts with faculty should be brought to the attention of the Director immediately, who will work with the Department Chair to resolve the conflict. If a student requests mediation, it will be provided via the Graduate School Ombudsperson. The student may meet with the Graduate School Ombudsperson at any time for advice and guidance.

If a student wishes to appeal any CBSC Probation decision or consequence, the appeal must be submitted directly to the Graduate School.

Changing Research Labs

It is rare for students to change labs within the CBSC program. However, when appropriate, due to divergent research interests or other factors, either the student or the Advisor is permitted to initiate a change in Advisor. All parties involved must be notified in writing of the change, with a copy of the letter provided to the CBSC Coordinator for inclusion in the student's file. It is the student's responsibility to obtain a new advisor within the same semester that the change occurs. Failure to obtain a faculty advisor within the same semester may result in dismissal.

*Student-initiated**:*** In some cases, students may opt to leave a research group if mediation and conflict resolution do not solve issues. To retain departmental/programmatic support, the student should secure a position in another research group before resigning from a position in the current lab. Written notification of the change from both the student and the student's new mentor is required and should be sent to the CBSC Director and copied to the Chair.

Advisor initiated: In some cases, a student may be asked to leave his/her research group. If an advisor requests leave, the student must take the initiative to find another advisor within the same semester (summer counts as one semester). Failure to join another lab group will result in the withdrawal of financial support and dismissal from the graduate program.

Time Away from Duties

CBSC students follow Graduate School policy on time away from duties. The University holiday calendar can be found here.

Requirements for Degree of Master of Science

Coursework Requirements

The plan of study approved by the Advisor and the Graduate Admissions and Examination Review Committee Chair must be completed before the end of the first semester of enrollment. The CBSC Graduate Program requires a minimum of 30 credits of coursework beyond the B.S. degree, including 6 credits of Master's Thesis Research (VMSC799; credits greater than 6 of this course will not be counted for degree requirement). A minimum of 12 credits must be earned in coursework at the 600 level or higher. Students are required to complete four credits of VMSC698 (Seminar in One Health) and one credit of BISI712 (Responsible Conduct of Research Biologists; it shall be taken in the first available Semester of enrollment), and four credits of VMSC758 (Journal Club of Comparative Biomedical Sciences). For other courses needed, see the list below. Students must also complete one course each of 400-level or higher courses in Biochemistry and Statistics if they have not already been completed as part of an earlier B.S. degree program. *Guidelines on coursework acceptable for graduate credit are provided at https://academiccatalog.umd.edu/graduate/policies/academic-record/#text. (Note: 100-300 level courses are not acceptable for graduate credit).*

M.S. students are required to take a total of 30 credits as outlined below:

Course	Title	Credits
BISI712	Responsible Conduct of Research Biologists	1
VMSC698	Seminar in One Health	4
VMSC758	Journal Club in Comparative Biomedical Sciences	4
_____		
Select at least 10 credits from the available VMSC courses:		
VMSC610	Recombinant Viral Vectors	3
VMSC660	Emerging and Re-emerging Infectious Diseases	2
VMSC670	Molecular Epidemiology of Infectious Diseases	2
VMSC689	Use of Genomics and Proteomics in Infectious Disease	3
VMSC720	Viral Pathogenesis	2
VMSC760	Immunology of Infectious Diseases	3
_____		
Statistics and Biochemistry (if needed)		
_____		
VMSC799	Thesis Research	6

With written consent from their Advisor, students may take additional courses that are not included in their approved Plan of Study. When the courses are from another graduate program on campus, prior authorizations for funds (internal and extramural) to be used to pay for the costs of these extra courses are required.

Thesis Requirement

A thesis must be submitted to the Graduate School. This thesis is approved by the Thesis Examining Committee appointed by the Dean of the Graduate School upon recommendation of the student's Advisor. The Advisor serves as the chairperson of the examining committee, and the

student's advisory committee typically serves as members of the examining committee. Committee membership must comply with Graduate School requirements. The submitted thesis must comply with the University of Maryland Thesis and Dissertation Style Guide. The template is also available in Microsoft Word.

Master Thesis Examination
For eligibility and committee nomination, follow the graduate school guidelines.

Procedures for the Oral Examination
Each master's thesis student must defend his or her master's thesis orally as a requirement in partial fulfillment of the master's degree (an additional, comprehensive written examination may be required at the option of the program). Scheduling of the examination (defense seminar) is made by the Advisor and should not exceed one hour (the public portion of the exam) in the CBSC Program. Scheduling and procedures of the oral examination must follow the graduate school guidelines.

Requirements for Master of Science in Comparative Biomedical Science *(Non-Thesis Option)*
The non-thesis Master of Science degree option is available only for doctoral students who wish to leave the graduate program without completing the Ph.D. External applications for the non-thesis master's option are not accepted. Additionally, the non-thesis master's degree program provides the opportunity for Ph.D. candidates to earn an M.S. degree while completing the course work appropriate for their Ph.D. program.

Students that decide to leave the Ph.D. program should meet with the Director of Graduate Program to discuss all options available. Following this meeting, the student should then meet with the program coordinator, who will review the student's academic background and specify any additional preparatory work deemed necessary. The program coordinator will annotate the student's electronic record to reflect the change in status.

Scholarly Paper
One scholarly paper must be written and approved by the student's Advisor. The paper is to be developed apart from course work. The source material for the paper can be current scientific literature, laboratory work, or field observations, and must contain a synthesis of the subject that goes beyond the current literature. During the semester before the paper is to be written, the student, advisor, and an additional faculty member, who will serve as a second reader of the paper, will meet to decide the area, topic, and scope of the paper. After this meeting, the student will write the paper, obtaining advice from the Advisor as necessary. The final paper must be submitted for approval by the Advisor and second reader at least two weeks before the final date specified by the Graduate School for submission of forms certifying degree completion. The paper must receive the written approval of both faculty members. After such approval is obtained, an electronic copy of the paper must be placed in the student's file in the CBSC Coordinator.

The proposal prepared for a successful preliminary examination for Ph.D. candidacy shall automatically satisfy the scholarly paper requirement for the non-thesis M.S.

Requirements for Degree of Doctor of Philosophy

Coursework Requirements

Ph.D. students without a previous M.S. degree or equivalent in Biology, Microbiology, or closely related discipline

The plan of study must be approved by the Advisor and the Graduate Admissions and Examination Review Committee by the end of the first semester of enrollment. Students that lack the M.S. degree must complete a minimum of 24 semester hours of coursework beyond the B.S. degree and 12 credits of VMSC899 (Doctoral Dissertation Research). This coursework includes a minimum of 12 credits of courses at the 600 level or higher, four credits of VMSC698 (Seminar in One Health), one credit of BISI712 (Responsible Conduct of Research Biologists; it shall be taken in the first available Semester of enrollment), and four credits of VMSC758 (Journal Club of Comparative Biomedical Sciences). For other courses, see the list below. Students must also complete one course each of 400-level or higher courses in Biochemistry and Statistics if they have not already been completed as part of an earlier B.S. degree program.

Ph.D. students without a previous M.S. degree or equivalent in Comparative Biomedical Science or a closely related discipline are required to take a total of 36 credits as outlined below:

Course	Title	Credits
BISI712	Responsible Conduct of Research Biologists	1
VMSC698	Seminar in One Health	4
VMSC758	Journal Club in Comparative Biomedical Sciences	4
VMSC610	Recombinant Viral Vectors	3
VMSC660	Emerging and Re-emerging Infectious Diseases	2
VMSC670	Molecular Epidemiology of Infectious Diseases	2
VMSC689	Use of Genomics and Proteomics in Infectious Disease	3
VMSC720	Viral Pathogenesis	2
VMSC760	Immunology of Infectious Diseases	3
Statistics and Biochemistry (if needed)		
VMSC899	Dissertation Research	12

With written consent from their Advisor, students may take additional courses that are not included in their approved Plan of Study. When the courses are from another graduate program on campus, prior authorizations for funds (internal and extramural) to be used to pay for the costs of these extra courses are required.

Ph.D. students who possess an M.S. degree or equivalent in Biology, Microbiology, or closely related discipline

In addition to 12 credits of VMSC899 (Doctoral Dissertation Research), a total of 12 credits of coursework are needed. The coursework includes two credits of VMSC698 (Seminar in One

Health), one credit of BISI712 (Responsible Conduct of Research Biologists; it shall be taken in the first available Semester of enrollment), two credits of VMSC758 (Journal Club of Comparative Biomedical Sciences). Select at least seven credits from the courses available in the department; see the list below. Students must also complete one course each of 400-level or higher courses in Biochemistry and Statistics if they have not already been completed as part of an earlier B.S. or M.S. degree program.

Ph.D. students with a previous M.S. degree or equivalent in Comparative Biomedical Science or a closely related discipline are required to take a total of 24 credits as outlined below:

Course	Title	Credits
BISI712	Responsible Conduct of Research Biologists	1
VMSC698	Seminar in One Health	2
VMSC758	Journal Club in Comparative Biomedical Sciences	2

And select at least seven credits from the courses available in the department, like:

VMSC610	Recombinant Viral Vectors	3
VMSC660	Emerging and Re-emerging Infectious Diseases	2
VMSC670	Molecular Epidemiology of Infectious Diseases	2
VMSC689	Use of Genomics and Proteomics in Infectious Disease	3
VMSC720	Viral Pathogenesis	2
VMSC760	Immunology of Infectious Diseases	3

Statistics and Biochemistry (if needed)

VMSC899	Dissertation Research	12

With written consent from their Advisor, students may take additional courses that are not included in their approved Plan of Study. When the courses are from another graduate program on campus, prior authorizations for funds (internal and extramural) to be used to pay for the costs of these extra courses are required.

Admission to Candidacy

By the end of the fourth semester, the student should have completed their core course requirement and should present a dissertation research proposal to the Advisory Committee. Upon approval of the proposal, the student should plan a qualification examination. A qualifying examination (equivalent to preliminary examination as mentioned in the Graduate School Catalog) must be completed satisfactorily before a student is admitted to candidacy. The examination must be completed by the end of the sixth semester of enrollment or earlier when all course requirements have been fulfilled. Under special circumstances and with the written permission of the CBSC Graduate Admissions and Examination Review Committee Chair, this time frame may be extended.

Research Proposal

- The research proposal can focus on the candidate's research or any other topic that the candidate and the Qualifying Examination Committee Chair determine is appropriate.
- The format of the research proposal shall follow the instructions for R01 available here. The proposal should include ONLY the following components: Project Summary, Specific Aims, Research Strategy, Literature Cited, and Biosketch described in the Grant Proposal Guide. The 12-page limit to the Research Strategy can be waived at the discretion of the qualifying examination committee. A brief budget and budget justification are encouraged but not required to allow the candidate to get familiar with budgeting. For research projects that are not covered by the NIH funding sources, the research proposal can use a format deemed appropriate by the Qualifying Examination Committee.
- A final version of the research proposal must be submitted at least two weeks before the scheduled committee meeting.
- An advisory committee meeting must be held three months before the scheduled Qualifying Examination date, and the advisory committee must approve the research proposal and the readiness of the candidate for the Qualifying Examination.
- The advisory committee shall review and assess the quality of the submitted research proposal.
  - ✦ If the committee finds the research proposal is satisfactory, the meeting is held as scheduled.
  - ✦ If the committee finds the research proposal is unsatisfactory, the candidate must reschedule the meeting date.

Qualifying Examination

The qualifying examination committee shall be nominated by the student in consultation with the Advisor and approved by the CBSC Graduate Admissions and Examination Review Committee. The qualifying examination committee consists of a minimum of five graduate faculty members, including one member to serve as the Dean's Representative. The Advisor is the Chair of the qualifying examination committee.

- **Objectives of the Qualifying Examination**
  - o An oral and written comprehensive examination is required for advancement to candidacy. The Qualifying Examination Committee has the primary charge of determining whether the candidate is competent to continue the Ph.D. program. For this purpose, the qualifying examination is designed to allow the candidate to:
- Demonstrate his/her general knowledge relevant to the major.
- Demonstrate effective communication of scientific information.
- Demonstrate mastery of their general area of scientific inquiry.
- Demonstrate the ability to apply knowledge and think critically to solve problems pertaining to the research field.
- **Requirements, Guidelines, and Procedures of the Qualifying Examination**
- A Nomination of the Qualifying Examination Committee accompanied by the report of the most recent advisory committee meeting must be submitted to the CBSC Graduate Admissions and Examination Committee Chair at least four weeks before the scheduled

Qualifying Examination date.

- The written examination shall be held at least ten business days before the scheduled oral examination date.
- Each committee member shall provide written questions to the major Advisor at least three days before the scheduled date of written examination. The committee member shall state the written questions for open or closed books and the time length of the exam. The major Advisor will arrange the location and time of the written examination.
- The major Advisor will collect the answers and deliver them to the original committee member giving the questions.
- For the oral examination, members of the Qualifying Examination Committee can participate by teleconferencing. However, the Chair and the Dean's Representative must be on-site.
- The examination cannot begin until a minimum of five Qualifying Examination Committee members are present (in person or online). During the oral examination, the student is expected to demonstrate in-depth expertise in his/her specific area of research and broad knowledge of related disciplines.
- At the end of the examination, all members of the committee vote on the student's performance. All members of the Qualifying Examination Committee must be available during the entire examination to be eligible to vote for the outcome of the Qualifying Examination. Two negative votes are sufficient to prevent a Ph.D. student's advancement to candidacy.
- The outcome of the Committee vote is to be reported in writing to the CBSC Graduate Admissions and Examination Review Committee Chair within 72 hours of the completion of the examination.
- It is the responsibility of the student to submit an application for admission to candidacy when all the requirements for candidacy have been fulfilled.
- Applications for admission to candidacy are made in duplicate by the student and submitted to the CBSC Graduate Admissions and Examination Committee Chair for further action and transmission to the Office of the Registrar.
- Candidacy forms must be received by the Office of the Registrar before the 25th of the month for the advancement to become effective the first day of the following month.
- Candidacy letter will be emailed to the student and department at the beginning of each month.
- After passing the qualification exam, the Doctoral candidates must register for six (6) credits of Doctoral Dissertation Research (VMSC899) in the following Spring and Fall semesters.
- Students that do not pass the qualifying examination may be re-examined one time. This second examination can occur at least three months after the first examination date but must be completed within 12 months of the first examination date. Failure to pass the qualifying examination a second time will result in termination of the student's program. The students who failed in the qualification examination may qualify for a non-thesis M.S. degree (see relevant section).

Benchmarks of the qualifying examination

Item	Deadline
Advisory committee meeting	At least three months before the qualifying exam
Submit a final version of the research proposal in NIH R01 format	Two weeks before the scheduled committee meeting
Written examination	At least ten business days before the oral examination
Oral examination	By the end of the sixth semester
Second qualifying examination (if failing the 1st qualifying exam)	At least three months after the first qualifying examination date but within 12 months after the first examination

Dissertation Requirement

A dissertation based on independent and original research must be submitted to the CBSC Program and the Graduate School. This dissertation is approved by the Dissertation Examining Committee appointed by the Dean of the Graduate School upon the recommendation of the student's Advisor. The Advisor serves as the chairperson of the dissertation examining committee, and the student's advisory committee typically serves as members of the examining committee. Committee membership must comply with Graduate School requirements for membership. The submitted dissertation must comply with the University of Maryland Thesis and Dissertation Style Guide.

Doctoral Dissertation Examination

Follow the Doctor of Philosophy Degree Policies in the Graduate Catalog.

Student Benchmarks

The following table summarizes student benchmarks for both M.S. and Ph.D. students:

Benchmark	MS Degree	Ph.D. Degree
Approved Plan of Study	Before the end of the 1st semester	Before the end of the 1st semester
Selection of Advisory Committee	Before the end of the 2nd semester	Before the end of the 4th semester
Committee meeting to approve Research Proposal	Not applicable	Before the end of the 4th semester
Advisory Committee Meeting	At least once per year from year two	At least once per year from year two
Annual Progress & Accomplishment Report	Yearly due every spring semester	Yearly due every spring semester
Candidacy Examination	Not applicable	Before the end of the 6th semester

Deadlines for Graduate Students

Deadlines for admissions, class registration, fellowships and awards, thesis, dissertation, and graduation can be found on the Graduate School's website. It is the responsibility of the students to comply with the various deadlines. In many cases, exceptions will not be granted.

Course Registration Policies

UMD registration policies

To be certified as full time, a graduate student must be officially registered for a combination of courses equivalent to 48 units per semester. All graduate students must register for courses and pay associated tuition and fees each semester, not including summer and winter sessions, until the degree is awarded. Graduate Assistants holding regular appointments have full-time status if they are registered for at least 24 units in addition to the assistantship (that means that a full T.A. or R.A. raises 24 units); holders of half-time assistantships are considered full-time if registered for 36 units (that means that a half time T.A. or R.A. raises 12 units). Audited courses do not generate graduate units and cannot be used in calculating full-time or part-time status. The Graduate School uses a unit system in making calculations to determine full-time or part-time student status. Please note that graduate units are different from credit hours. The number of graduate units per credit hour is calculated in the following manner:

- Courses in the series: 000-399 carries two units per credit hour (courses may be taken [i.e., as pre-requisite] but will not be counted as graduate credit).
- Courses in the series: 400-499 carry four units per credit hour.

- Courses in the series: 500-599 carry five units per credit hour.
- Courses in the series: 600-897 carry six units per credit hour.
- Master's thesis Research: 799 carries 12 units per credit hour.
- Pre-candidacy Doctoral Research courses: 898 carry 18 units per credit hour.
- Doctoral Dissertation Research: 899 carries 18 units per credit hour. All doctoral candidates must pay candidacy tuition for which they will be registered for six (6) credit hours of 899; this defines all currently registered doctoral candidates as full-time.

Specific policies on Doctoral Dissertation Research: 899.

- Students who have advanced to candidacy must register before the start of the Fall and Spring semesters.
- Students are registered for sections based on previous registration.
- Students must be registered for six credits during the Fall and Spring semester, no more, no less.
- Requests to retro-register for 899 credits MUST be approved by the Graduate School by submitting a petition.

Additional information on registration policies can be found on the websites of the Graduate School.

CBSC Policies

The CBSC program will use registration blocks to ensure the graduate students are following UMD registration policies and meeting the CBSC program policies. Registration blocks will be lifted by the Program when a student has completed the following:

1) Made satisfactory progress towards the removal of admission provisions, if applicable;
2) Sent a copy of the approved Plan of Study (justification is required if the student is taking courses not listed in the Plan of Study).
3) The sent nomination of Advisory Committee form and had at least one Advisory Committee Meeting per year from year two;

CBSC Graduate Program Forms and General Forms from the Graduate School

The CBSC Graduate Program forms are included in Appendix I of this document (most of them are fillable). Reporting forms of thesis or dissertation defenses are generated by the Office of the Registrar and will be sent to the Chair of the examination committee before scheduled dates of defenses.

General forms from the Graduate School (in most cases, they are fillable) can be found on the Graduate School's website.

Appendix I

CBSC Graduate Program Forms

INITIAL PLAN OF STUDY

Comparative Biomedical Science (CBSC) Graduate Program

Student Name/UID:_____Advisor:_____

Degree Objective:_____M.S._____Ph.D. Year/Semester Enrolled_____

I. Admission Provisions (if any):

II. List by semester all coursework completed and planned for the M.S. or Ph.D. degree. Attach a separate sheet if more space is required.

Year	Semester	Course No.	Title	Credit

Total credits_____

Signature of Advisor_____ Date _____

Signature of Chair of Admissions and Examination Committee _____

Date _____

Note: All future updates of your plan of study must be submitted online

COMPARATIVE BIOMEDICAL SCIENCE GRADUATE PROGRAM

APPOINTMENT OF RESEARCH ADVISORY/EXAMINATION COMMITTEE

Name of Student/UID _____

Degree Objective: _____MS _____Ph.D.

COMMITTEE MEMBERS:

	Name and Title	Department Affiliation
1.	_____(Chair)	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____(Dean's Rep)	_____

PLEASE NOTE:

1. M.S. student advisory/examination committee must include a minimum of three (3) members, at least two (2) of whom are Full Members of the Graduate Faculty.
2. Ph.D. student, advisory/examination committee, must include five (5) members of the Graduate Faculty, at least three (3) of whom must be Full Members.
3. A Tenured member of the UMCP Graduate Faculty from a department other than Advisor's one is required to serve as Dean's Representative on Ph.D. committees.

Approved:_____ Date: _____

Signature of Chair of Graduate Admission and Examination Committee

COMPARATIVE BIOMEDICAL SCIENCE GRADUATE PROGRAM

RESEARCH PROPOSAL/PLAN APPROVAL

Name of Student:_____**Name of Advisor**:_____

Degree Objective:_____M.S._____Ph.D. **Year in Program** _____

Title of Research Proposal/Plan (submit a copy of the research proposal with this form to the Graduate Director):

Date of Proposal Meeting: _____

Committee Members:

	Name	**Signature**	**Date**
1.			
2.			
3.			
4.			
5.			
6.			

Conditions & Comments:

_____ _____

Academic Program Director (Name and Signature) Date

Indicate if any of the following applies to this research:

Human Subjects. Will this research include the use of Human Subjects? Yes No
If yes, has an IRB application been submitted to the IRB office?
Please provide the title used on the IRB application and the IRB protocol approval number.

An IRB application has not been submitted for this project but will be before this project is conducted. Submit one copy of the proposal protocol form to the IRB office. For more information, contact the IRB office at irb@umd.edu.

Animals. Will this research include using vertebrate animals? Yes No
If yes, has an IACUC protocol approval number been assigned?
Please provide the title used in the IACUC application and the IACUC protocol approval number.

An IACUC application has not yet been submitted for this project. For more information, contact the IACUC Coordinator at x55037 or iacuc-office@umd.edu

Radioactive Materials. Will radioactive materials or ionizing radiation producing devices be used in this research? Includes x-ray units, electron microscopes, and particle accelerators; non-ionizing radiation producing devices such as lasers, I.R., U.V., or other optical emitting devices; and/or microwaves, R.F., or electromagnetic sources of radiation.
Yes No

If yes, will these devices be_ ionizing and/or non-ionizing radiation-producing? The Department of Environmental Safety, Sustainability & Risk (ESSR) requires radiation safety training and an approved authorization prior to the use of such devices. Call DES, x53960, for assistance.

Genetically engineered organisms:
Will genetically engineered organisms be used or produced in this research? Yes No
If yes, please explain.

Biological materials: Will this research use biological materials? e.g., recombinant DNA or RNA, human pathogens, toxins, or blood, unfixed tissue, or primary cell culture derived from humans or non-human primates. Call ESSR, x53960, for assistance.
Yes No
If recombinant experiments are already registered, provide an approval number.

Select Agent Toxins: Will this research require the use of one or more of the following select agent toxins: e.g., Abrin, Botulinum neurotoxins, Clostridium perfringens epsilon toxin, Conotoxin, Diacetoxyscirpenol (DAS), Ricin, Saxitoxin, Shiga toxin, Shiga-like ribosome-inactivating proteins, Staphylococcal enterotoxins, T-2 toxin, Tetrodotoxin?

Yes No
Call ESSR, X53960 for assistance.

Highly toxic gases: Will this research use highly toxic/reactive gases (e.g., arsine, hydrogen cyanide, cyanogens, silane, fluorine, etc. Call ESSR, X53960 for assistance)? Yes No

Chemicals: Will this project require the use of chemicals? Yes No
If this project includes the use of chemicals, OSHA requires a Chemical Hygiene Plan and training. Call ESSR, X53960 for assistance.

If you check yes to any of the above, proper assurances must be completed and obtain from ESSR.

Report of Annual Advisory Committee Meeting
Comparative Biomedical Science Program

Student:_____Date of meeting: _____Advisor_____

Degree objective: MS ____ Ph.D. ____ Year in program _____

Committee Report (use additional sheets as necessary):

Summary comments: The student has made satisfactory progress._____Yes_____No

	Typed/printed name	Signature	Date
Advisor/Chair	_____	_____	_____
Member	_____	_____	_____
Member	_____	_____	_____
Member	_____	_____	_____
Member	_____	_____	_____
Member	_____	_____	_____

Student acknowledges and agrees to this committee: _____ _____
Signature Date

Approved by the Academic Program Director: _____ _____
Signature Date

COMPARATIVE BIOMEDICAL SCIENCE GRADUATE PROGRAM

APPOINTMENT OF QUALIFYING EXAMINATION COMMITTEE

Name of Student_____Estimated Date of Exam: _____

COMMITTEE MEMBERS:

	Name		Department Affiliation
1.	_____	(Chair)	_____
2.	_____		_____
3.	_____		_____
4.	_____		_____
5.	_____	(Dean's Rep)	_____

PLEASE NOTE: The Qualifying examination committee must include five (5) members of the Graduate Faculty, at least three (3) of whom must be Full Members. A regular member of the UMCP Graduate Faculty from other departments is required to serve as the Dean's Representative.

Approved:_____Date: _____
Printed Name and Signature of Graduate Admissions and Examination Review Committee

COMPARATIVE BIOMEDICAL SCIENCE GRADUATE PROGRAM

QUALIFYING EXAMINATION COMMITTEE REPORTING FORM

Name of Student:_____ Name of Advisor:_____

Years in Program_____ Date of Qualifying Examination:_____

Title of Research Proposal/Plan (submit a copy of the research proposal with this form to the Graduate Director):

Committee Members:

	Name	Signature	Date
Chair:	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
Dean's Rep			
	_____	_____	_____

The outcome of the qualifying examination

The student has (passed or failed)_____the qualifying examination.

If the student passed the examination, the Advisor is required to submit an Application for Admission to Candidacy form to the Office of the Registrar. If the student failed the examination, a second trial of the examination could be scheduled between 3-12 months from this examination date.

Conditions & Comments:

_____ _____

Graduate Admissions and Examinations Committee Chair (Name &Signature) Date

Graduate Outcome Assessment

Comparative Biomedical Science (CBSC) Graduate Program

MS Thesis Defense Evaluation

Candidate Name: _____ Advisor: _____

Date of Evaluation: _____

Thesis Title: _____

Instructions: Each member of the thesis defense examination committee should complete this evaluation, and completed forms should be submitted to the CBSC Graduate Coordinator.

Evaluation Criteria	Does Not Meet Expectations	Meets Expectations	Exemplary Performance
1. **Problem Definition**: The research problem is clearly stated and articulated			
2. **Literature and Previous Research**: Demonstrates a thorough knowledge of literature in the area of research and prior research on the specific research topic			
3. **Impact of Research**: Demonstrated the value of the research and how it advances knowledge within the area of study			
4. **Research Approach**: Sound and appropriate research methods/tools used to solve the research problem, and the methods/tools were described effectively			
5. **Results**: Analyzed and interpreted research results/data effectively and appropriately			
6. **Quality of Written and Oral Communication**: Research results were clearly communicated both written and orally			
7. **Critical Thinking**: Demonstrated capability for independent research and expertise in the area of study and ability to make original contributions to the field			
8. **Broader Impact**: Demonstrated awareness of broader impacts of the research to the field of study			
9. **Publications**: Journal or conference publications have or will result from this research			

Overall Assessment: The assessment of the overall performance of the candidate based on the criteria provided in items 1-9 above.

CRITERIA	PERFORMANCE RATINGS		
	Does Not Pass Thesis Defense Examination	Passes Thesis Defense Examination	
Overall Rating of the Thesis	Does not meet Expectations	Meets Expectations	Exemplary Performance

Name of Examination Committee Member: _____

Signature of Examination Committee Member: _____

Graduate Outcome Assessment

Comparative Biomedical Science (CBSC) Graduate Program
Ph.D. Candidacy Examination Evaluation

Student Name: _____ Advisor: _____

Date of Evaluation: _____

Instructions: Each member of the supervisory committee should complete this evaluation, and completed forms should be submitted to the CBSC Graduate Coordinator.

Criteria	Exemplary	Strong	Competent	Marginal	Unacceptable
Understanding of Questions	□□ Responds incisively and directly to questions asked.	□□ Most responses are direct and relevant to the questions asked.	□□ Responds adequately to questions asked; occasionally responds with unrelated information	□□ Confuses some significant concepts in the questions asked.	□□ Does not understand questions and/or concepts.
Response to Questions	□□ Responses to questions are specific, dependable, and complex.	□□ Responses to questions are more general but still accurate: analyses go beyond the obvious.	□□ Responses to questions are overly general and disorganized; they may have some factual, interpretive, or conceptual errors.	□□ Response to questions are vague or irrelevant.	□□ No discernable response to most questions asked.
Support of Arguments	□□ Provides substantial, well-chosen evidence and used strategically.	□□ Provides sufficient and appropriate evidence to support arguments.	□□ Provides some evidence but not always relevant, sufficient, or integrated into the response.	□□ Evidence usually only narrative or anecdotal; awkwardly or incorrectly used to support arguments.	□□ Little or no evidence is used to support arguments.
Communication of Responses	□□ Responses are presented and communicated in a professional manner.	□□ Most responses are presented and communicated well; few problems in the communication of ideas and concepts.	□□ Responses are generally presented and communicated adequately; occasional problems in the communication of ideas and concepts.	□□ Responses sometimes repetitive and not a related topic; frequent problems in the communication of ideas and concepts.	□□ Responses are not coherent, illogical poorly structured; student fails to communicate ideas and concepts.

Name of Committee Member: _____

Signature of Committee Member: _____

Graduate Outcome Assessment

Comparative Biomedical Science (CBSC) Graduate Program

Ph.D. Dissertation Defense Evaluation

Candidate Name: _____ Advisor: _____

Date of Evaluation: _____

Thesis Title: _____

Instructions: Each member of the thesis defense examination committee should complete this evaluation, and completed forms should be submitted to the CBSC Graduate Coordinator.

Evaluation Criteria	Does Not Meet Expectations	Meets Expectations	Exemplary Performance
1. **Problem Definition**: The research problem is clearly stated and articulated			
2. **Literature and Previous Research**: Demonstrates a thorough knowledge of literature in the area of research and prior research on the specific research topic			
3. **Impact of Research**: Demonstrated the value of the research and how it advances knowledge within the area of study			
4. **Research Approach**: Sound and appropriate research methods/tools used to solve the research problem, and the methods/tools were described effectively			
5. **Results**: Analyzed and interpreted research results/data effectively and appropriately			
6. **Quality of Written and Oral Communication**: Research results were clearly communicated both written and orally			
7. **Critical Thinking**: Demonstrated capability for independent research and expertise in the area of study and ability to make original contributions to the field			
8. **Broader Impact**: Demonstrated awareness of broader impacts of the research to the field of study			
9. **Publications**: Journal or conference publications have or will result from this research			

Overall Assessment: The assessment of the overall performance of the candidate based on the criteria provided in items 1-9 above.

CRITERIA	PERFORMANCE RATINGS		
	Does Not Pass Thesis Defense Examination	Passes Thesis Defense Examination	
Overall Rating of the Thesis	Does not meet Expectations	Meets Expectations	Exemplary Performance

Name of Examination Committee Member: _____

Signature of Examination Committee Member: _____

Appendix II. Description: Statement of Mutual Expectations *(From Graduate School)*

A Statement of Mutual Expectations (SME) is a written document that outlines the fundamental duties of the graduate research assistant and describes the responsibilities of the graduate research assistant and certain processes related to the assistantship. Its purpose is (1) to assist the graduate research assistant in better understanding his/her duties, how to fulfill them, and how to meet the supervisor's expectations and (2) to better assist the supervisor with oversight and supervision of the graduate research assistant, and how to facilitate a successful graduate research assistantship for the student. The Graduate School recommends that an SME be prepared at the start of every graduate research assistantship, and for continuing assistantships, updated at least annually. All graduate research assistantships are subject to University of Maryland (U.M.) policies and procedures as set forth in the Graduate Catalog. Graduate research assistants are not employees, the SME is not a contract, and nothing in the SME supersedes U.M. Policies. In the event of a conflict between U.M. policies and the SME, U.M. policies control. The SME is intended to be a flexible document that provides a structure to help both the graduate research assistant and supervisor understand the nature and obligations of the graduate research assistantship; because of the great diversity of assistantships at Maryland, some of the sections of the standard document may not be applicable to all assistantships. Suggested sections to include in the SME are as follows:

Responsibilities of Research Assistant: Include the most important duties of the assistantship. Potential topics would be specific responsibilities, goals, deliverables (if any), and how they are to be submitted.

Responsibilities of Supervisor: Specify the most important responsibilities of the supervisor (with regard to the assistantship). Potential topics would be: information on how the graduate research assistant will receive continuing guidance and support, times when the supervisor will be available, supervisor office hours, training schedule, a description of the process for project design, how the graduate research assistant will be supervised, procedures for ordering supplies.

Scheduling: When the assistantship is to be performed, including work hours, regularly scheduled meetings, degree of flexibility in work schedule, and/or vacation and holiday procedures.

Procedures and Best Practices: Required training, standard methods, key contacts, required recordkeeping, safety, and security protocols, and/or procedures for ordering supplies.

Professional Development and Individual Development Plan: Topics include skills to be learned during the appointment (if any), training resources other than those provided directly by the supervisor, whether the academic publication is expected or desired as a part of the assistantship, and/or potential expectations for travel.

Organizational Culture: Considerations such as office space, workspace, dress codes, appropriate titles, and means of address, and/or team norms.

Useful Resources:
Department of Environmental Safety: http://des.umd.edu
Disability Support Services: http://counseling.umd.edu/DSS/
Institutional Review Board (IRB): http://www.umresearch.umd.edu/RCO/New/index.html
Institutional Animal Care and Use Committee (IACUC):
http://www.umresearch.umd.edu/IACUC/index.htm
Individual Development Plan (IDP) tool offered by AAAS: http://myidp.sciencecareers.org/

Form: Statement of Mutual Expectations

Graduate Research Assistant: **Supervisor:**
Period of Graduate Research Assistantship covered below:

This Statement of Mutual Expectations (SME) is intended to describe and clarify the duties, responsibilities, and procedures that make for a productive appointment as a Graduate Research Assistant. All graduate research assistantships are subject to University of Maryland (UM) policies and procedures as set forth in the Graduate Catalog. Nothing in this SME supersedes UM policies. See http://apps.gradschool.umd.edu/catalog/assistantship_policies.htm. In the event of a conflict between UM policies and this SME, University policies control.

Responsibilities of Graduate Research Assistant (e.g., specific duties, goals, deliverables, reporting)

Responsibilities of Supervisor (e.g., availability, project design, supervision, office hours, training)

Scheduling (e.g., work hours, meetings, vacation and holiday procedures)

Procedures and Best Practices (e.g., training, standard methods, safety, and security protocols, ordering)

Professional Development and Individual Development Plan (e.g., skills, training, publication, travel)

Organizational Culture (e.g., office space, workspace, dress codes, titles and means of address)

Other Notes:

We have met in person to review and discuss this agreement on the date noted below. The GRA was given an opportunity to ask and receive answers to any questions about the assistantship:

Graduate Research Assistant
Signature: _____ Date:

Supervisor
Signature: _____ Date: