DEPARTMENT OF BIOLOGY

GRADUATE STUDIES GUIDE

HOWARD UNIVERSITY

www.biology.howard.edu

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GRADUATE PROGRAM

Overview

The Department of Biology offers graduate programs leading to the Master of Science and Doctor of Philosophy degrees in two major areas of concentration: 1) Cell and Molecular Biology (CMB) and 2) Ecological, Environmental and Systematic Biology (EESB). **CMB** offers specialization in cell biology, molecular biology, genetics, neurobiology, physiology, developmental biology, microbiology and bioinformatics, while **EESB** offers specialization in ecology, evolutionary biology, environmental biology, conservation biology, and organismal biology. Incoming graduate students may elect any area of their choice leading to either M.S. or Ph.D. degree; however, the Ph.D. program is the major focus of the departmental graduate program. The department also participates in the M.D./Ph.D. degree program jointly offered by the Graduate School and Howard University College of Medicine.

Learning Outcomes

By the time of the thesis or dissertation defense, graduate students within our program are expected to demonstrate substantial scholarship and the ability to conduct independent research and analysis in biology.

Specific learning outcomes from our graduate program are:

- Master subject-matter knowledge and skills,
- Demonstrate independence in critical thinking and analysis,
- Generate excellent scholarship in written and oral forms through production, publishing and presenting of research results,
- Exhibit professional integrity and ethical values within academic, research, and professional arenas, and
- Develop into leaders at local, national, and global levels.

PROGRAM ADMINISTRATION

The Graduate Studies Committee of the Department of Biology is charged with administration of the Graduate Program.

The Graduate Studies Committee shall consist of the Graduate Director, four members of the graduate faculty of the Department of Biology and two graduate student representative. The Chairperson of the Committee is the Director of Graduate Studies and is appointed by the Chairperson of the Department of Biology and approved by the Dean of the Graduate School. The student representatives are Department of Biology graduate students nominated by their peers. The student representatives shall have voting privileges and may be involved in all Committee matters except where access to student records is required, during meetings when individual students are being discussed, and during the application review process.

A graduate student may consult the Graduate Studies Committee at any time on matters concerning his/her/their graduate program.

Roles of Graduate Studies Committee:

- develops and implements policies and procedures for the operation of the Department of Biology Graduate Program;
- reviews applications from prospective graduate students and recommends candidates for admission to full faculty of Department of Biology;
- reviews new graduate courses being proposed by Biology faculty;
- reviews annual Graduate Student Progress reports and provides feedback to students were necessary;
- oversees student progress towards their degree;
- reviews proposed External Examiners for dissertation defenses;
- provides information to the Student Evaluation Committee regarding recommendations for Department's Graduate Assistantships;
- plans for future development in the area of Graduate Biology education and research in the University;
- prepares and submits an annual report of Program activities and accomplishments for the Chairperson of the Department of Biology; and
- ensures that regular review of the Biology Graduate Program is carried out.

Roles of Graduate Director:

- with the assistance of the Graduate Studies Committee, administers the Graduate Program and the activities of the Biology Graduate Program;
- convenes and chairs meetings of the Graduate Studies Committee;
- acts on behalf of the Graduate Studies Committee to implement the Biology Graduate Program (i.e.- to sign candidacy application forms, to approve final recommendation of the External Examiner, to sign final defense documents); and
- serves as the link between the Department of Biology and the Howard University Graduate School;

Faculty of the Graduate Program in the Department of Biology

The faculty of the Graduate Program include all faculty members of the Department of Biology who are Graduate Faculty of the Howard University Graduate School. Graduate Faculty are active in research in Biology as evidenced by current record of research support and recent refereed publications based upon that research. Additionally, Graduate Faculty actively participate in the Graduate Program and Program activities.

A comprehensive Faculty List of all members of the Department of Biology Graduate program can be found on the Department's website.

ADMISSION REQUIREMENTS

The Graduate Studies Committee will evaluate applications to the Department of Biology. Applicants should apply for admission to the Graduate Program in Biology through GradCas. Admission and residency in the graduate program in Biology are guided by the General Admission Requirements and the *Graduate School Rules and Regulations for the Pursuit of Academic Degrees* of the Howard University Graduate School. Applicants are strongly encouraged to consult and familiarize themselves with these rules and regulations.

Applicants are expected to have an undergraduate background in the biological sciences or a related field. Training appropriate for admission to the Biology Graduate Program is a minimum of two years of college level biology, including a course in genetics; two years of chemistry, including Organic Chemistry; one year of mathematics, through pre-calculus; and one year of physics. Students deemed qualified but not having appropriate training may be admitted provisionally. Applicants are required to submit scores for the Graduate Record Examination (GRE). Note that the criteria for admission are identical for both applicants to the Ph.D. and Master programs.

Decisions on applications will be based on the following considerations:

1. The applicant's official transcripts.

2. Three letters of recommendation, preferably from members of the academic community familiar with the applicant's academic performance.

3. Review of the following documents submitted with the application: current CV/resume, the brief personal statement, and an application essay. The personal statement can include an applicant's academic journey and interest in science. The application essay should include comments on the applicant's current and potential future research interests.

4. Admission to the Ph.D. Program requires prior agreement of a Graduate Faculty member to act as the student's advisor in the Department. Therefore, applicants are strongly advised to contact those faculty members with whom their research interests are matching. Contact information and research interests of the Graduate Faculty are available at the departmental website (www.biology.howard.edu).

International Applicants

In addition to the requirements listed above, international applicants must submit the following:

- Official transcripts, final certificates and/or mark/grade sheets must be sent directly from the college or university to the Office of Graduate Recruitment and Admissions, and must show proof of degree(s) earned, courses taken and marks/grades received. Also, ALL transcripts **must** be evaluated by World Education Services

(www.wes.org) or AACRAO (www.aacrao.org) and be forwarded to Graduate Recruitment and Admissions. If the documents are not in English, an official translated copy must accompany them.

- All documents must bear the same name that appears on the admissions application unless an official document so submitted indicating a change of name.

- Test of English as Foreign Language (TOEFL) from all applicants from countries in which English is not the official language. The minimum score needed on the TOEFL is set by the Howard University Graduate School and applicant's are therefore advised to consult the Graduate School Admission Requirements. The TOEFL test is not required if the applicant received a prior degree in the U.S.

- Statement of Financial Resources Form (http://www.gs.howard.edu/admissions/default.html) A completed form that verifies proof of financial support (sufficient funds to cover expenses for one full year) and supporting financial documentation indicating sources of funds while attending Howard University (such as a certified bank statement dated within three months of registration). Verification of six months history with bank.

Provisional admission: In exceptional cases (good grades in science subjects, research experience attested to by publication etc.), applicants deemed qualified but who have not fulfilled all admission requirements may be admitted on a provisional basis. All provisional students will be required to remedy identified weaknesses or deficiencies through appropriate course work planned in consultation with the Director of Graduate Studies, a temporary adviser and/or the Graduate Studies Committee. A provisional student must earn a minimum GPA of 3.0 during the first year of full-time study. Transfer to regular status will be made by vote of the Graduate Studies Committee. The student will receive written notice of transfer to regular status.

Identification of Research Advisor (prior to joining the Graduate Program)

Prior to joining Howard University, all graduate applicants are expected to contact a prospective mentor(s) based on their research interest. The prospective mentor has to agree to accept the student into his/her laboratory when the student arrives at Howard University. If a potential mentor's laboratory is full, the Graduate Studies Committee may recommend the applicant to join another laboratory based on the student's interest. Students are encouraged to discuss their research topic with their prospective mentors, and begin developing the necessary background in specific research area. While some of these initial projects may become the thesis or dissertation topic, students are not required to remain with their initial research topic.

Under rare situations, a Biology graduate student may work with a major research advisor outside of the Department of Biology Faculty. In this case the student must also have an internal research advisor within the Department of Biology. Both research advisors will serve on the student's Ph.D. Guidance Committee. In this situation an additional Guidance Committee member must be added to ensure the total Committee membership remains distributed such that the majority of members do not directly advise the student. See Guidance Committee section for more information.

Advising and mentoring is only a mutual agreement and not a contract. So, in the event a student wants to work with a different advisor during the course of their M.S. or Ph.D. work, it is within their rights to do so. However, the Director of Graduate Studies and the Chairman of Biology Department must be consulted if such change is necessary. See Appendix A on "Changing Research Labs" for procedure.

Change of Program:

M.S. to Ph.D. — Graduate students admitted to the M.S. program in the Department of Biology are expected to complete the degree before applying to the Ph.D. program. To become a Ph.D. student, they must complete a full application for the Ph.D. program and go through the admission process as a new entrant. If they complete their M.S. degree, they can transfer **up** to 24 credit hours towards their Biology Ph.D. degree requirements (per Howard University *Graduate School Rules and Regulations for the Pursuit of Academic Degrees*). If the M.S. student does not complete their M.S. degree, they can still complete an application and apply to the Ph.D. program, but then they can only transfer 18 credits of their Biology coursework towards their Ph.D. degree requirements (per Howard University *Graduate School Rules and Regulations for the Pursuit of Academic Degrees*).

Transfer from Another Department within Howard University — Graduate students from other Departments at Howard University seeking transfer to the Department of Biology must complete a full application and go through the Howard University Graduate School admission process as a new candidate. In addition, the applicant must submit an official release document from the original department. Transfer students must have a 3.0 cumulative GPA or higher to be considered for transfer to the program.

PROGRAM TERMINOLOGY AND INFORMATION FOR ALL STUDENTS

Research Advisor

Each student (M.S. or Ph.D.) must identify a research advisor prior to being accepted to the program.

A research advisor's primary task is to mentor and guide their students to reach their full scholarly potential. The advisor should promote conditions conducive to a student's research and intellectual growth. The responsibilities of the thesis/dissertation advisor is to help the student in formulating a viable research project, train them in the right direction, meet with the student regularly, monitor student progress, and encourage the student to publish their work in peer reviewed journals. It is not obligatory for a thesis/dissertation research advisor to provide summer support but all advisors are strongly encouraged to gather external funds so that students are supported during the summer to maintain the continuity of research and training.

The research advisor's responsibilities include, but are not limited to, the following:

- Guiding student in the selection and planning of an original research topic that can be completed within the expected time to degree requirements
- Providing appropriate guidance on the progress of research and expected standards
- Being accessible to give advice and provide feedback. Feedback should be professional and constructive and provide concrete guidance for improvement.
- Ensuring the student has an understanding of the relevant methodology and technical skills necessary for the research
- Working with the student to establish a thesis or dissertation committee early-on (i.e.- no later than immediately after completion of the qualifying examination) and ensuring that the committee meets with the student at least once a year, as a committee, and provides an annual written report of the student's progress
- Encouraging participation in attendance at Departmental seminars
- Encouraging and assisting students to attend and present work at local, national, or international conferences
- Encouraging and assisting students to publish their work in appropriate journals.
- Advising on matters of professional development, career options, and the job market.
- Advising the student on seeking additional funding, as needed
- Ensuring the research environment is safe, equitable and free from harassment and discrimination
- Being sensitive to academic needs and concerns that may arise
- Communicating in a timely manner if the student's academic performance is not meeting expectations, providing an outline for what actions need to be taken in order to return to academic good standing and a timeline for doing so.
- Serving as an advocate for the student
- Providing financial support for the student's essential research supplies that are directly related and in accord with the advisor's research directive

Biology Graduate Student

When a student enters a graduate program, that student commits the time and energy necessary for research leading to the creation of a thesis or dissertation. This thesis or dissertation will make a substantial and original contribution to knowledge.

The Biology graduate student's responsibilities include, but are not limited to, the following:

- becoming familiar with, understanding and adhering to the rules, policies, and procedures in place by Howard University, the Howard University Graduate School and the Department of Biology program requirements and procedures
- conducting research
  Research is an integral part of graduate education. All M.S. and Ph.D. students are expected to be involved in research programs early in their graduate careers, to conduct research as they take courses, and to pursue a full-time research program during the summer months, although only limited teaching assistantships are available during summer.
- regular attendance at Department seminars
  Seminars and meetings play an important role in the dissemination of knowledge, particularly of material prior to publication. Graduate students are strongly encouraged to attend the weekly Departmental seminars. They are also encouraged to attend seminars in other departments, as well as those at other institutions throughout the area. Students should also consider attending meetings of scientific societies, particularly those related to their research.
- application to pre-doctoral fellowships
  All eligible first and second year Ph.D. students are required to apply for a National Science Foundation (NSF) fellowship. The application deadline is typically early November. Students in their third year and beyond are strongly encouraged to apply for other fellowships for which they are eligible. These include (but are not limited to) the NIH NRSA, Bio-X, DoD NDSEG, SIGF and DARE fellowships.
- service on a Departmental Committee
  Service is an important value of Howard University and an excellent professional development opportunity for graduate students. All graduate students are strongly encouraged to serve on the Departmental Committees that require graduate student representatives. The current Committees with graduate student representatives are: Executive Committee, Graduate Studies Committee, Curriculum Committee, Student Evaluation & Recommendation Committee, Space & Facilities, Safety, Senior Comprehensive, Seminar Series, and Social Media Committee. Nominations for graduate student representatives for each of these committees comes from the Biology Graduate Student body.
- selecting and planning an original research topic that be completed within the expected time frame for the degree program. In most cases this will be done in consultation with the thesis/dissertation advisor.
- learning and adhering to responsible conduct of research standards for your field

- meeting with the research advisor when requested and reporting regularly on progress and results
- establishing a thesis/dissertation committee, with the assistance of the research advisor, early in the research stage
- keeping your advisor informed of how you can be contacted and informing them of any significant changes that may affect the progress of the research
- maintaining good records of each stage of the research
- being a good lab and Department citizen
- when necessary, planning to seek additional funding as needed well in advance
- building skills to support future career goals (for example through teaching, presenting research, internships, etc)

Guidance Committee

The graduate experience is greatly enhanced if faculty members other than the direct research advisor are readily and formally available for consultation and discussion with the graduate student. To provide this, every graduate student will work with their major Research Advisor to form a Guidance Committee early in their graduate training but no later than the end of their first year (M.S.) or second year (Ph.D.). The Guidance Committee consists of additional faculty members who will help to train, support, and educate the graduate student. The responsibilities of the Guidance Committee are to guide and assist in research where appropriate, approve thesis/dissertation proposals, conduct the qualifying examinations, conduct proposal defense, conduct annual advisory meetings, and serve as thesis/dissertation examiners.

The M.S. Guidance Committee shall consist of a minimum of three members: the student's Major Advisor and two other Biology faculty members who are not directly guiding the research. Additional members above the minimum of 3 previously described can be added to the Guidance Committee should the student and Major Advisor deem this necessary.

The Ph.D. Guidance Committee shall consist of four members: the student's Major Advisor(s) and three additional faculty members who are not directly guiding the research. One member may be selected from “outside” the Department of Biology. This committee member will be expected to interact both with the student and other members of the Guidance Committee. This individual may be drawn from another Department within Howard University, another University, or an off-campus institute. This individual may not serve as the Outside Examiner during the dissertation defense. A resume of this member should be available and they should meet the qualifications to be a graduate faculty member at Howard University.

It is not uncommon for Guidance Committee membership to change for a variety of reasons, including faculty leaving Howard University. If a student needs to replace any member of their Guidance Committee they are able to do that.

DEPARTMENTAL REQUIREMENTS FOR BIOLOGY GRADUATE STUDENTS

All Biology graduate students are required to:

- complete safety training and responsible conduct of research (RCR), as required by individual PI (prior to entering the laboratory- see below) and the ORRC (prior to entering candidacy)
    - Biology requires completion of an appropriate Biosafety module before graduate students can enter the research laboratory.
- submission of semester program of study signed by the student and the research advisor (see below)
- submission of an annual progress report due end of Spring semester (see below)
- annual Departmental seminar/presentation (after the graduate student has completed their 2nd full year as a graduate student)
- meet annually with their Guidance Committee (after entrance into candidacy)

Laboratory Safety Training

All Biology lab personnel are required to be trained in the basic laboratory safety pertaining to their specific laboratory prior to physically working in the lab. These lab safety modules will be completed using the currently approved Howard University modules. The Research Advisor is responsible for ensuring the graduate student is made aware of the appropriate safety courses they need to take.

Required courses may include but are not limited to:

- General Safety & Emergency Preparedness
- Chemical Safety for Labs
- Biosafety
- additional training related to lab specific research

Responsible Conduct Of Research

All students are required to attend and pass the Howard University Graduate School Responsible Conduct of Research in person workshop(s) and/or online courses. This should be done in the first year of the program. Students are held to professional and ethical standards set forth by Howard University.

Semester Program Of Study

Graduate students in consultation with their major advisor are required to submit a Program of Study document each semester to the Director of Graduate Studies. The approved Departmental form will be circulated by the Director of Graduate Studies. The Program of Study should be completed and discussed prior to the Major Advisor providing the registration PIN to the graduate student for the subsequent semester.

Annual Evaluation Of Student Progress And Timeline

Graduate students, in consultation with their major advisor, are required by the end of each academic year to submit an annual progress report to the Director of Graduate Studies. The approved Departmental form will be circulated by the Director of Graduate Studies. This form is due no later than May 15th each year.

Howard University Graduate School regulation mandates that the Ph.D. degree should be completed within 7 years and M.S. degree should be completed within 5 years. Failure to complete these degrees within the specified period may result in dismissal. Also, credit for courses taken more than five years and less than seven years ago for the M.S. degree, or more than seven years and less than 10 years ago for the Ph.D. degree, must be restored by an examination approved by the departmental Graduate Studies Committee. For further details, students are referred to the *Graduate School Rules and Regulations for the Pursuit of Academic Degrees*. If for any reason this time period has to be extended, the student must petition to the Graduate School through his/her major advisor, the Director of Graduate Studies and the Department of Biology Graduate Studies Committee.

Annual Seminar Presentation

All Biology graduate students who have completed their second full year in the Biology graduate program are required to present their research annually in the Departmental Seminar Series. This consists of a 30-minute talk to the entire Department. The seminar series is organized by a Biology faculty member and graduate students above their second year are responsible to ensure they are included on the list and that they complete this requirement.

> *Note: Written petitions for exemptions to requirements are considered by a student's Guidance Committee and the Director of Graduate Studies. Approval is contingent on special circumstances and is not routinely granted.*

Annual Guidance Committee Meeting (Students In Candidacy)

It is the graduate student's responsibility to arrange a meeting of their Guidance Committee each academic year after they have successfully advanced to candidacy. At this meeting the student will present a brief presentation outlining their progress over the prior year and submit to questioning about their work.

During this Annual Committee meeting, students and their Guidance Committee should discuss:

- recent research progress
- goals for next Committee meeting
- progress towards goals discussed in late Committee meeting (if appropriate)
- a timeline to graduation within the stated Graduate School guidelines
- a timeline towards publication
- If applicable, a written petition for extending time to degree beyond that allowed by the Howard University Graduate School with explicit anticipated date for graduation.

The Guidance Committee then discusses the student's progress with the Major Advisor (in the absence of the student) and with the student (in the absence of the Major Advisor).

The Annual Guidance Committee Report form should be completed by each Guidance Committee member during the annual committee meeting. This form will comment on the student's satisfactory or unsatisfactory research progress and include specific suggestions for future areas of improvement and/or completion of degree requirements. These forms must be included in the student's annual progress report and submitted to the Director of Graduate Studies following the Guidance Committee but no later than May 15th.

Graduate Teaching Assistantships

Teaching experience is valuable for all graduate students. Experience teaching in the classroom will benefit any graduate student who intends to pursue a career in which public speaking, presentation skills and program planning are used. The Department of Biology has a set number of Graduate Teaching Assistantships (GTAs) available to fund graduate students to teach courses, typically laboratory sections. GTAs can consist of stipend support, tuition support, or both stipend and tuition support. The Department has limited GTA positions, and is not obligated to provide assistantships to all of its students.

The Department of Biology holds a policy to offer Graduate Teaching Assistantships (GTAs) to doctoral students for up to a maximum of 5 years. On rare occasions, an additional one-year GTA may be granted upon justification from the Research Advisor. Beyond 6 years, no Ph.D. candidate can receive a teaching assistantship from the Department of Biology. While priority for GTAs is given to Ph.D. students, those students in the M.S. program can apply and potentially receive a maximum of 3 years of GTA support.

To apply for a GTA, new and continuing graduate students should submit a Departmental application in the Spring semester for consideration for a GTA position for the following academic year.

Typical GTA teaching responsibilities include, but are not limited, to the following:

- Assist in the preparation and grading of exams, problem sets, etc.
- Run laboratory sections which includes setting up experiments, checking equipment, supervising students, cleaning-up experiments and grading submitted laboratory assignments
- Hold regular office hours
- Assist in preparation and distribution of course handouts
- Attend lecture
- Attend weekly GTA planning meetings with the instructor of record
- Provide student course feedback to instructor

Student performance of teaching duties will be evaluated annually by the faculty member(s) responsible for the course(s) in which the student participates as a GTA.

Notification of GTA Support From The Department

Continuing students who applied for GTAs will receive a GTA notification letter no later than the beginning of the Fall term that states whether they will receive support, and then the type and amount of funding for the new academic year.

Honor Code

All graduate students are expected to abide by the University's Academic Code of Student Conduct. Any violations of the Academic Code of Student Conduct will be subject to the procedures and penalties as listed in the *Graduate School Rules and Regulations for the Pursuit of Academic Degrees.*

Grievances

If concerns arise during a student's time in the Graduate Program, the student is expected to exhaust all possible avenues at the Departmental level before moving to file a grievance with the Graduate School. The student should first attempt to resolve the issue with faculty or staff directly involved. If this proves unsatisfactory, the student should approach the Departmental Chairperson and/or Graduate Director. If this is not appropriate given the nature of the concern, students should approach the individual they deem appropriate to discuss their concern.

Vacation Policy

Graduate students are at the same time University employees and research trainees, which complicates the interpretation of holidays. Graduate students are trainees embarking on a research career and should plan to take advantage of the semester breaks and the summer to work in the laboratory or library (ca. 40 hours/week). They will experience that these class breaks allow long periods of uninterrupted work that are essential for the completion of a successful research or writing project. Once students are in the laboratory of their Research Advisor, they should negotiate when to take vacations and how long they will be gone from the laboratory. Attendance at scientific meetings or specialized courses is not considered vacation. If a student is a paid teaching assistant, vacations should be planned around their course responsibilities.

Students Receiving Federal Financial Aid

Students who receive financial aid to support their attendance in Graduate School need to be mindful of all terms of their financial aid agreement. This includes, but is not limited to, maintaining satisfactory academic progress (SAP), number of credits that must be registered for each semester in order to be eligible for financial aid, and the number of years they are eligible to receive financial aid for. This is the student's responsibility and does not fall under the purview of the Department of Biology or Biology Graduate Studies Committee.

REQUIRED COURSES FOR A GRADUATE DEGREE IN BIOLOGY

1. The Department of Biology Graduate Program has four core courses. The number of core courses required differs between the M.S. student (must complete 2 out of 4, see M.S. section below for further clarification) and the Ph.D. student (3 out of 4). The core courses are:

   (a) *Biochemistry,* 3-4 credit hours, which can be satisfied by any of the following options:
      i. *Biochemistry,* BIOC101, 4 credit hours or
      ii. *Biochemistry,* CHEM251, 3 credit hours
   (b) *Molecular Biology of the Cell,* BIOG532, 4 credit hours
   (c) *Ecological and Environmental Biology,* BIOG533, 4 credit hours
   (d) *Evolutionary and Systematic Biology,* BIOG534, 4 credit hours

2. Two semesters of Graduate Seminar Courses
   This includes Graduate Seminar (BIOG500, 1 credit hour) and Graduate Seminar (BIOG501, 1 credit hour).

3. Biological Writing for Graduate Students (1 credit) (BIOG200)

4. Electives: Additional elective courses as recommended by the student's Major Advisor and/or Guidance Committee. Ph.D. students are required to complete a minimum of 19 elective course credit hours and M.S. students are required to complete a minimum of 8 elective course credit hours.

Credit Requirements For Ph.D. Degree In Biology

A minimum of seventy-two (72) credit hours is required for the Ph.D. degree.

Core Courses[$]	11 credit hours *
Graduate Seminar Courses	2 credit hours
Biological Writing Course (BIOG200)	1 credit hour
Elective Courses	19 credit hours *
Ph.D. Research (BIOG699)	27 credit hours *
Ph.D. Dissertation (BIOG700)	12 credit hours *
TOTAL	72 credit hours [&]

$ candidates for the Ph.D. degree are required to take any three of the four previously listed core courses prior to applying for candidacy.

** Note these are the minimum credit hours required in each area to meet the Ph.D. degree requirement, however most students will end up having significantly more research and dissertation credit hours than the minimum listed above.*

& at least fifty (50) of the 72 credit hours must be earned within the Department of Biology

Students admitted to the Ph.D. program are allowed to transfer up to 18 credit hours of graduate course work (post-undergraduate degree confer) or 24 credit hours of graduate course work if from a completed Master's degree. These transfer credits will be reviewed the first semester in residence of the Ph.D. program by the Graduate Studies Committee in order to determine their appropriateness for usage towards a Biology Ph.D.. However note it is always up to the discretion of the student's Guidance Committee to require more coursework than the minimum credit hours should they identify a deficiency in the student's knowledge and preparation. If transfer credit hours will be applied to core courses then the Howard University Instructor of Record for that core course should evaluate the appropriateness the course transfer request.

Once the required number of Ph.D. Research (BIOG699) credit hours are fulfilled (27 credits), all additional hours will receive either an S (Satisfactory) or U (Unsatisfactory) grade. Ph.D. Dissertation (BIOG700) credit hours will receive either an S (Satisfactory) or U (Unsatisfactory) grade until the student has defended their dissertation. Only after successful defense, will the BIOG700 grades will be changed to a letter grade.

Credit Requirements For M.S. Degree In Biology

A minimum of thirty (30) credit hours is required for the M.S. degree.

Core Courses[$]	7 credit hours *
Graduate Seminar Courses	2 credit hours
Biological Writing Course (BIOG200)	1 credit hour
Elective Courses	8 credit hours *
M.S. Research (BIOG599)	6 credit hours *
M.S. Thesis (BIOG600)	6 credit hours *
TOTAL	30 credit hours[&]

$ All candidates for M.S. degree are required to take two out of the four previously listed core courses prior to applying for candidacy. M.S. students must take either Biochemistry or Molecular Biology of the Cell, and then either Ecological and Environmental Biology or Evolutionary and Systematic Biology.

** Note these are the minimum credit hours required in each area to meet the M.S. degree requirement, however most students will end up having significantly more research and dissertation credit hours than the minimum listed above.*

[&] at least fifteen (15) of the 30 credit hours must be earned within the Department of Biology

Once the required number of M.S. Research (BIOG599) credit hours are fulfilled (6 credits), all additional hours will receive either an S (Satisfactory) or U (Unsatisfactory) grade. M.S. Thesis (BIOG600) credit hours will receive either an S (Satisfactory) or U (Unsatisfactory) grade until the student has defended their dissertation. Only after successful thesis defense, will the BIOG600 grades will be changed to a letter grade.

ADMISSION TO CANDIDACY

Candidacy is defined as that period in a graduate student's studies when they are deemed ready to undertake independent and original research resulting in a thesis (M.S.) or a dissertation (Ph.D.). Pre-candidacy studies typically involve intensive coursework and training in the basic skills of research, scholarship and professional practice appropriate to the discipline. Post-candidacy studies typically involve conducting the research that is required for completion of the final degree requirements and generation of the thesis/dissertation. Students who have advanced to candidacy are termed M.S. candidates or Ph.D. candidates. Masters students are required to submit for candidacy by the third semester; Ph.D. students by the end of the fourth semester (2nd year).

Students advance to candidacy by passing their comprehensive examination, completion of the Graduate School candidacy application, and approval by the Graduate School.

Admission to candidacy requires:

a) a minimum of four semesters of research;
b) a minimum GPA of 3.0 or higher with no more than two C's in graduate level courses at Howard University; and
c) submission of a completed application for candidacy (see below).

Application for candidacy includes submission of the following documents:

1. An approved thesis/dissertation research proposal signed by all members of the Guidance Committee.
2. A completed candidacy application form signed by the Major Advisor, Director of Graduate Studies and Departmental Chairperson.
3. Students need to pass the Comprehensive Examination given by the candidate's Guidance Committee, this includes the appropriate number of written or oral qualifying examinations and the oral proposal defense (see section on Comprehensive Examination for more details)
4. Completion of Department of Biology Core courses and writing course
5. Completion of required Graduate School RCR workshop
6. Completion of all required online CITI modules as set by the Graduate School
7. Completion of appropriate Mandatory Research Review (e.g.- IRB, IBC or IACUC approval or exemption of research proposal)
8. Approval letter or approved exclusion letter from the Office of Regulatory Research Compliance (ORRC) to certify completion of the mandatory research review
9. Other requirements that the Howard University Graduate School might require in the future for entrance into candidacy.

The Departmental signatures and dates on the candidacy application must be placed *after* the student presents proof that they have completed all candidacy requirements.

Note- Per Graduate School Rules and Regulations for the Pursuit of Academic Degrees, candidacy for the Ph.D. degree shall be valid for no more than five academic years. Candidacy for the Master's degree shall be valid for no more than two academic years.

Comprehensive Examination

The purpose of the comprehensive examination is to evaluate the student's ability to apply and synthesize the skills and knowledge acquired during their graduate study and in their particular research area. It is an important benchmark in a graduate student's progress towards candidacy. The Biology Department does not conduct one comprehensive examination for all graduate students. The student's own Guidance Committee is in the best position to determine the specific content of the comprehensive examination. The comprehensive examination should be taken in the first two years in residence for Ph.D. students and within the first three semesters in residence for M.S. students.

The Comprehensive Examination is comprised of three parts:

1. A written proposal of the thesis or dissertation research in a format determined by the research/major advisor.
2. Qualifying examinations, written or oral, one from each member of the Guidance Committee (this should be completed prior to the oral proposal defense).
3. An oral proposal defense to the Guidance Committee. This is an oral presentation of the proposed research and any preliminary data to the Guidance Committee, followed by questioning of the student by the Guidance Committee.

If a student fails any part of the Comprehensive examination, they must take that part of the examination again. A student who fails their Comprehensive Examination twice will be dismissed from the program.

Qualifying Examinations

All Qualifying Examinations will be administered by the members of the Guidance Committee, with the Major Advisor serving as the coordinator. As an M.S. Guidance Committee consists of 3 members (the faculty advisor and two other Biology faculty), an M.S. student must take 3 qualifying exams, one from each Committee member. As a Ph.D. Guidance Committee consists of 4 members (the faculty advisor and three other faculty), a Ph.D. student must take 4 qualifying exams, one from each Committee member.

The examinations should stress the student's ability to integrate and analyze information, and should be completed prior to the student scheduling their oral proposal presentation to their committee. An individual member of the Guidance Committee shall decide the exact format (oral and/or written) and content of their examination. The examination will be scheduled at the convenience of the student and each individual Guidance Committee member. After successful completion of each individual qualifying examination, the Guidance Committee member administering that qualifying examination will sign the student's Qualifying Examination Completion Form.

All three components of the Comprehensive Examination must be completed **before** the Thesis or Dissertation Proposal Approval Form can be signed by the Guidance Committee and included in the student's application for candidacy.

Standard Operating Procedures for Comprehensive Examination:

Student:

- Work with Research Advisor to identify guidance committee members.
- Contact and meet individually with guidance committee members (at least 2 months prior to examination)
- Prepare for and take 3 (MS student) or 4 (PhD student) written/oral qualifying examinations from each member of the Guidance Committee.
- Schedule date and time of meeting for candidacy proposal presentation
- Bring candidacy application to oral proposal presentation for signatures by Guidance Committee members

Guidance Committee members:

- Design clear, concise questions that test the student's understanding of individual topics for the written/oral qualifying examination
- Meet with student (if requested) to guide student's preparation for examination
- Evaluate student's examination answers within a week of the examination and communicate results to student and Research Advisor
- Fill out and sign the student's qualifying examination completion form
- Read and provide feedback on written proposal
- Attend and evaluate student during oral proposal presentation
- Guidance Committee Chair (identified by Research Advisor/Student):
    - run the candidacy proposal presentation meeting
    - determine that student is meeting all the required course work of the program

REQUIREMENTS FOR COMPLETION OF Ph.D. DEGREE IN BIOLOGY

The degree of Doctor of Philosophy will be awarded upon the student's demonstration of mastery of certain fields of knowledge, ability to conduct independent research, and ability to organize research into an acceptable dissertation that represents a significant contribution to the student's field of study. The specific requirements in addition to those listed in the *Graduate School Rules and Regulations for the Pursuit of Academic Degrees* are:

1. A minimum of seventy-two (72) semester hours of graduate work, inclusive of the dissertation, at least fifty (50) of which must be earned within the Department of Biology;

2. An approved Program of Study including all such courses and requirements specified by the Graduate Faculty;

3. Admission to Candidacy (see section Admission to Candidacy)

4. A cumulative GPA of 3.0 (B) with no more than 2 C's

5. Successful defense of the Dissertation to include completion of written dissertation and oral defense as approved by the Candidate's Guidance Committee and following all requirements of the Graduate School.

REQUIREMENTS FOR COMPLETION OF THE M.S. DEGREE IN BIOLOGY

The degree of Master of Science will be awarded upon the student's demonstration of mastery of certain fields of knowledge and the completion of a formal thesis. The specific requirements in addition to those listed in the *Graduate School Rules and Regulations for the Pursuit of Academic degrees* are*:*

1. A minimum of thirty (30) semester hours of graduate work, inclusive of the thesis, at least fifteen (15) of which must be earned within the Department of Biology.

2. An approved Program of Study including all such courses and requirements specified by the Graduate Faculty;

3. Admission to Candidacy (see section Admission to Candidacy)

4. A cumulative GPA of 3.0 (B) with no more than 2 C's

5. Successful defense of Thesis to include completion of written thesis and oral defense as approved by the Candidate's Guidance Committee and following all requirements of the Graduate School.

MASTER THESIS AND THESIS DEFENSE

The Master Thesis will be based on laboratory or field research conducted during the course of study. The thesis cannot be primarily based on literature research. A completed research project is expected for the thesis. The student's Research Advisor and Guidance Committee will be responsible for guiding the student in the research project and in the writing of the thesis. The Research Advisor will assist in scheduling the thesis defense.

Pre-Thesis Defense Meeting

It is the student's responsibility to arrange a meeting with the Research Advisor and Guidance Committee prior to scheduling the oral defense (usually 4-6 months before the anticipated defense date). At this meeting, discussion and evaluation of the student's research progress will occur and if deemed appropriate, the student will be given permission to begin writing the thesis.

Thesis Structure

A typical thesis will include the following areas, but can be modified based upon the direction of the student's Research Advisor.

1. Abstract
2. Introduction
3. Methods
4. Results
5. Discussion
6. Bibliography/References Cited

Additionally, all thesis guidelines as indicated by the Howard University Graduate School must be followed.

Thesis Examination Committee

The Thesis Examination Committee shall consist of the three-member Guidance Committee. An additional member(s) can be added if the Guidance Committee deems it appropriate and necessary for a complete and thorough examination of the thesis research.

Oral Thesis Defense

Formal defense of the thesis in a public seminar in front of the Thesis Examination Committee (see above) constitutes the final MS examination. The defense shall be open to all who chose to attend. The defense must be announced and posted publicly two weeks before the defense date.

The defense comprises two parts:

1. a one-hour public seminar in which the student presents their research and explains how it contributes to the advancement of their field
    i. Approximately a 45 minute research talk

ii. 10-15 minutes of questions/comments from the audience and Examination Committee (maximum of 1 question per examination committee member)

2. a closed session with oral questioning of the student by the Thesis Examination Committee
    i. initial round of questioning by Examination Committee
    ii. second round of questioning by Examination Committee

There is no minimum time limit for the oral thesis defense, but it may not exceed two hours.

Failure of the Final Oral Examination

Any candidate who fails the final oral examination may be given a second oral examination, provided the second oral examination does not come earlier than two months (60 days) from the date of the first oral examination. Application for a second oral examination must be approved by the department. Failure of the second oral examination is final.

PH.D. DISSERTATION AND DEFENSE

The Ph.D. Dissertation will be based upon original investigation which shows significant research in the individual's major field. The dissertation should demonstrate the candidate's familiarity with the methods of research, and the candidate's ability to organize and present effectively the results of their research. To be acceptable, the dissertation should be a worthwhile and novel contribution to knowledge in the student's field of concentration. The student's Research Advisor and Guidance Committee will be responsible for guiding the student in the research project and in the writing of the dissertation. The Research Advisor will assist in scheduling the dissertation defense.

Pre-Dissertation Defense Meeting

It is the student's responsibility to arrange a meeting with the Research Advisor and Guidance Committee prior to scheduling the oral dissertation defense (usually 4-6 months before the anticipated defense date). At this meeting, discussion and evaluation of the student's research progress will occur and if deemed appropriate, the student will be given permission to begin writing the dissertation.

Dissertation Structure

A typical thesis will include the following areas, but can be modified based upon the direction of the student's Research Advisor.

1. Abstract
2. Introduction
3. Methods
4. Results
5. Discussion
6. Bibliography/References Cited

Additionally, all dissertation guidelines as indicated by the Howard University Graduate School must be followed.

Dissertation Examination Committee

The Dissertation Examination Committee shall consist of the four-member Guidance Committee plus an additional member drawn from "outside" of Howard University, referred to as the external examiner (see below).

External Examiner (for Ph.D. dissertation defenses)

The external examiner is an individual who has an established reputation in the area of the dissertation research and is able to judge whether the dissertation is acceptable at a university comparable to Howard University. The external examiner holds a Ph.D. and is an individual of comparable rank to a Graduate Faculty member at Howard University. The external examiner should not have interacted with the Guidance Committee or the student in any substantive capacity prior to being invited to serve on the final Dissertation Committee. In other words, the student must not know, work with, have contact with, or have any affiliation with the external examiner. The external examiner may be drawn from the consortium, another university, or an off-campus research institute. The proposed external examiner is nominated by the student's Research Advisor and/or Guidance Committee. They must submit a curriculum vita, must meet the qualifications to be a graduate faculty member at Howard, and must receive approval from the Howard University Graduate School to serve on the Dissertation Examination Committee

Oral Dissertation Defense

Formal defense of the dissertation in a public seminar in front of the Dissertation Examination Committee (see above) constitutes the final Ph.D. examination. The defense shall be open to all who chose to attend. The defense must be announced and posted publicly two weeks before the defense date.

The defense comprises two parts:

1. a one-hour public seminar in which the student presents their research and explains how it contributes to the advancement of their field
    i. Approximately a 45 minute research talk
    ii. 10-15 minutes of questions/comments from the audience and Examination Committee (maximum of 1 question/examination committee member)
2. a closed session with oral questioning of the student by the Dissertation Examination Committee
    i. initial round of questioning by Examination Committee
    ii. second round of questioning by Examination Committee

There is no minimum time limit for the dissertation defense, but it may not exceed three hours.

Failure of the Final Oral Examination

Any candidate who fails the final oral examination may be given a second oral examination, provided the second oral examination does not come earlier than two months (60 days) from the date of the first oral examination. Application for a second oral examination must be approved by the department. Failure of the second oral examination is final.

APPENDIX A: CHANGING RESEARCH LABS

When appropriate, due to differing 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 Biology Graduate Director and the main office 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 occurred. Under exceptional circumstances, the Graduate Director may allow the student an additional semester to obtain another advisor. Failure to obtain a faculty advisor within a year of the change may result in cancellation of matriculation. Note that previous research conducted by the student remains with the previous advisor unless otherwise agreed upon by both the new and previous advisor.

Student initiated: In some cases students may opt to leave a research group if mediation and conflict resolution do not solve issues. In order to retain departmental/programmatic support, the student should secure a position in another research group before resigning a position in their current lab. Written documentation of the change through completion of the Graduate Student Laboratory Transfer form is required and should be sent to the Graduate Director. The student does not need to have permission from the previous research advisor in order to switch research laboratories. However the previous research advisor will be informed of the intention to switch either by the student or the Graduate Director.

Advisor initiated: In some cases, students may be asked to leave their research group. If an advisor requests that a student leave his/her research group, the student must take initiative to find another advisor within 1 semester (summer counts as 1 semester). Upon identification of a new laboratory, the student must complete the Graduate Student Laboratory Transfer form and submit to Graduate Director. Failure to join another lab group will result in withdrawal of financial support and dismissal from the graduate program.

Official Process:

1. The student (or advisor) meets with the Graduate Director and Chair of the Biology Department to discuss their concerns regarding the current situation.
2. If student initiated, the student is responsible for finding a new advisor who is willing to accept them into their laboratory.
3. If advisor initiated, the student is informed by the Graduate Director that they are being asked to leave their current research group. The student will then take initiative to find another advisor.
4. The Graduate Director and Chair will contact both the current/previous and new advisor to discuss the change.
5. The student will fill out paperwork documenting the switch in laboratories and which requires the signature of the student, the new advisor, the previous advisor (secured by the Graduate Director), the Graduate Director and the Chair of the Department. A copy of this document will then be provided to the previous advisor and placed in the student's file.