



**DEPARTMENT OF CELL AND MOLECULAR BIOLOGY  
HANDBOOK FOR GRADUATE STUDENTS  
School of Graduate Studies in the Health Sciences  
The University of Mississippi Medical Center**

For students entering Fall, 2019. Updated: July 24, 2019

This handbook is designed to clarify certain of the rules and regulations of the UMMC School of Graduate Studies in the Health Sciences (SGSHS) and to describe the policies and requirements specific to the Department of Cell and Molecular Biology. Each student should also obtain the [Bulletin of the University of Mississippi Medical Center](#) which is available from the Office of Student Services and Records and the UMMC Graduate Student Handbook which is available from the Office of the Graduate School.

## **I. PROGRAM OVERVIEW**

The Department of Cell and Molecular Biology offers a 4-5 year program of study leading to the Ph.D. degree. The program begins with course work, followed by a combination of course work and laboratory research and finishes with independent research conducted in the laboratory of one of the faculty.

The department has 12 primary faculty members and six faculty members with secondary appointments from Medicine, Neurology, and the Cancer Institute. Research interests are diverse and include:

- the structure and function of eukaryotic chromatin
- molecular mechanisms of hormone action
- mitochondrial dysfunction in disease states
- mitochondrial copper chaperones
- regulation of the cell cycle
- characterization and organization of macromolecular complexes
- molecular dynamics of microtubule assembly and disassembly
- structure-function relationships of antimetabolic drugs
- mechanisms of antimetabolic resistance
- nuclear organization and disease
- cancer drug and therapeutic delivery
- genetic models of disease, including the use of zebrafish
- the regulation of ciliary assembly and ciliary/flagellar motility
- androgens and cardiometabolic complications
- sex differences in blood pressure control and postmenopausal hypertension
- nicotine, sex steroids, adipocytes, and hypertension

The department is well equipped for biochemical training and research. Each faculty member has generous laboratory space and the specialized equipment necessary for their research. In addition, there is an abundance of shared, state-of-the-art, departmental equipment and facilities. All full-time students receive a graduate research assistantship for three years after which they or their advisor are expected to obtain independent support. Application for [predoctoral funding](#) is promoted as an essential part of the students training and development. The Department of Cell and Molecular Biology is strongly committed to graduate research and teaching.

## **II. UNDERGRADUATE PREPARATION**

The academic background of applicants to the graduate program in Cell and Molecular Biology should include chemistry, organic chemistry, introductory biology or zoology and college algebra.

Strongly recommended are courses in quantitative analysis, physical chemistry, biochemistry, cell biology, physics and calculus. Because the University of Mississippi Medical Center is not physically associated with an undergraduate campus, there is relatively little opportunity to correct academic deficiencies onsite. All applicants must demonstrate both oral and written proficiency in the English language.

### III. ADMISSION PROCEDURE

All students must secure admission to the University of Mississippi Medical Center through the Office of Student Services and Records ([How to Apply](#)). Applicants must submit an official transcript including all of their previous college or university work as part of their application for admission. An overall grade point average of at least 3.0 on an A=4.0 scale is expected. The Graduate Record Examination is also required for all students. The TOEFL examination is required for international students.

Admission to the graduate program is contingent upon approval by the department ([Department of Cell and Molecular Biology](#)). Interested persons are encouraged to make preliminary inquiries to the department concerning its recommendations for admission and the availability of graduate assistantships before making formal application to the Graduate School. However, only after the official application is completed will the applicant's file be reviewed by the Cell and Molecular Biology faculty and a formal recommendation for admission made.

### IV. PROGRAM OUTCOMES

#### Mission Statement:

The overall objective of the Ph.D. program in Cell and Molecular Biology is for each student to achieve competency in both the coursework and research components of the program and develop critical thinking and communication skills. With this knowledge base and skill set, graduating students will be equipped to pursue a variety of different career options. To ensure that each student meets the objective of the Ph.D. program, many different competencies will be evaluated, as listed below.

#### **Information gathering & research planning**

- Master basic concepts of biochemistry, cell and molecular biology and incorporate a sufficient knowledge base for the initiation of independent research (course work)
- Identify a topic of research interest
- Search for literature relevant to a topic of interest
- Critically evaluate research publications
- Organize and integrate information obtained from a literature search
- Develop informed questions/hypotheses about a research topic
- Identify long-term research goals relevant to a topic of interest
- Identify and prioritize accessible research questions/hypotheses that further research goals

#### **Conducting research**

- Master basic laboratory skills
- Identify feasible methods to test/explore questions/hypotheses
- Design and implement controlled experiments
- Collect and analyze data
- Critically evaluate data; use results to refine previous hypotheses
- Work as an effective member of a research team
- Develop personal responsibility for research
- Develop responsibility for directing research/teaching laboratory skills

#### **Communication skills**

- Record research activity: the lab notebook
- Prepare effective data presentations: graphs, tables
- Organize an oral presentation of research
- Write a logical, clear research paper for publication
- Write a persuasive research proposal

*The mentor will discuss the above competencies with the student and utilize the following rating system (1 = not met, 2 = partially met, 3 = fully met). Student progress in achieving these competencies will be shared with and discussed by the graduate program director and the student's dissertation committee.*

## **V. PROGRAM OF STUDY AND RESEARCH LEADING TO THE Ph.D.**

The graduate program in Cell and Molecular Biology is oriented toward the Ph.D. degree. In the first year, students complete a general biochemistry course, a course in laboratory techniques and one to two advanced courses in cell and molecular biology. Beginning in the second semester, students rotate in three laboratories of their choice, for 6 weeks each, in order to choose a Research Advisor and a laboratory in which to conduct their independent research.

During the summer of the first year, students begin their research in their host laboratory. In the second year, students complete the majority of their graded course work and assemble their Graduate Advisory Committee. At the end of the second year students are required to pass the written Comprehensive Examination, based on the course work (described in detail below).

During the third year students continue research, write a Research Proposal on the topic of their research, present this proposal to the department, and then defend their proposal plus the necessary biochemical expertise in the oral Qualifying Examination conducted by their Graduate Advisory Committee. Upon completion of the Research Proposal and the Qualifying Examination, the student may apply to the Graduate School for advancement as a Candidate for the Ph.D. degree.

For the rest of the program, the student continues in full-time research, although they may choose to participate in additional advanced courses in order to strengthen their training in major and/or minor subject areas. In addition, students will continue to take part in Departmental seminars and journal clubs. The final award of the Ph.D. depends upon 1) the satisfactory completion and defense of a Dissertation describing the student's independent research, and 2) the acceptance of at least one first author manuscript in a respected peer-reviewed scientific journal. The Ph.D. is conferred for work of distinction in which the student displays original scholarship and in recognition of marked ability and achievement. In no way should it be assumed that the degree will be granted only upon faithful performance of the minimum standards.

The Graduate School requires that all full time students must be enrolled for at least 9 hours each semester until admission to candidacy. Upon admission to candidacy the student must maintain full time status by enrolling in a minimum of 1 hour each semester.

### **1. Course Requirements**

**Policy Overview.** Students are required to complete a minimum of 60 credit hours of course work. All of the graded course work required to advance to Candidacy is completed in the first two academic years. It is expected that students will maintain a B average. One grade below B will require remedial action, while more than one grade below B will constitute grounds for dismissal from the Ph.D. degree program. Students may not drop courses in which they are enrolled without the approval of their Research Advisor and/or Program Director. Up to a **maximum** of 6 semester credit hours of completed course work may be transferred from other graduate programs if the courses are equivalent to those offered in the UMMC School of Graduate Studies in the Health Sciences. Credit will not be given for both the course taken in another department or at another institution and a Department of Cell and Molecular Biology course. Acceptance of transfer credits requires the approval of the departmental Cell and Molecular Biology Program Director and the Dean of the Graduate School.

Both the Cell and Molecular Biology Department and the School of Graduate Studies requires all first year graduate students to enroll in ID (Interdepartmental) 709, Responsible Conduct of Research (2 credit hours) and ID 714, Professional Skills for Graduate Students (3 credit hours). In addition, the Cell and Molecular Biology Department requires all first year students to take CMB 710, Graduate Biochemistry (10 credits); CMB 720, Journal Club (1 credit hour per term); CMB 740, Biochemical Methods (2 credit hours) and CMB 741, Advanced Biochemical Methods (1 credit hour). Prior to admission to Candidacy all students must also complete CMB 711, Mechanisms of Enzyme Action (2 credit hours); CMB 715, Physical Biochemistry (2 credit hours); CMB 742 Research Tools in Molecular Biology (3 credit hours); and CMB 744, Cellular Biochemistry (6 credit hours). At the completion of CMB 710, 711, 715, 740, 741, 742, 743, 744 and ID 709 each student must have an overall grade point average (GPA) of 3.0 or better. Failure to achieve this requires remediation or it may lead to dismissal from the program. These decisions are made by the student, the student's Research

Advisor, the Cell and Molecular Biology Program Director and the Department Chair. Note: Students in the Cell and Molecular Biology Ph.D. program are required to achieve an 80% or above in CMB 710 (see below).

#### **A. Courses offered every year.**

(CMB 730 and CMB 731 are utilized by special arrangement. CMB 704 is not open to Cell and Molecular Biology majors.)

**CMB 704** - *Fundamental Biochemistry* (Fall semester, 7 credit hours) This course presents a broad survey of biochemistry suitable for students whose major area of study is outside the discipline. Topics include the chemistry, synthesis and degradation of cellular macromolecules; enzymology; metabolism and metabolic regulation; membrane structure and function; signal transduction and hormonal control mechanisms, molecular biology and protein synthesis as well as aspects of oral biology and dental biochemistry. (Also listed as Dental 604). **This course is not open to Cell and Molecular Biology majors.**

**CMB 710** - *Graduate Biochemistry* (Fall semester, 10 credit hours)  
A comprehensive course in biochemistry including the structure and synthesis of amino acids and proteins, nucleic acids, carbohydrates, lipids and membranes, enzymology, metabolism and metabolic regulation, physical biochemistry, signal transduction, hormonal control mechanisms, differentiation, molecular genetics and protein synthesis. **All students in the Cell and Molecular Biology Ph.D. program are required to obtain an 80% or higher in CMB 710. Remediation will consist of two opportunities to obtain an 80% or higher on a comprehensive multiple choice exam assembled by the faculty. For example, if a student makes a 78% on the first remediation exam, they must make an 80% or higher on the second remediation exam. Remediation must be complete by the beginning of the Spring semester. Failure to achieve an 80% or higher on the remediation exam will result in the dismissal of the student from the program.**

**CMB 730** - *Special Topics I* (Any semester needed)  
This course is used for special instruction, as needed. (Time and credit hours to be arranged)

**CMB 731** - *Special Topics II* (Any semester needed)  
This course is used for special instruction, as needed. Available only to graduate students registered in the Department of Cell and Molecular Biology (Time to be arranged) (1-2 credit hours each semester, maximum of 3 credit hours)

**CMB 740** - *Biochemical Methods* (Fall semester, 1<sup>st</sup> year, 2 credit hours)  
An introductory lecture and laboratory course designed to acquaint the student with the research projects and techniques available in the Cell and Molecular Biology Department.

**CMB 741** - *Advanced Biochemical Methods* (Spring semester, 1<sup>st</sup> year, 1 credit hour)  
An advanced laboratory course in which the student participates in abbreviated research projects (6 weeks per rotation) in a lab of any Cell and Molecular Biology faculty member.

#### **B. Courses offered in odd numbered academic years.**

These courses emphasize "Practical Biochemistry" in that they are primarily focused on methods:

**CMB 711** - *Mechanisms of Enzyme Action* (Spring semester, 2 credit hours)  
A study of the kinetics, mechanism of action, metabolic regulation and the chemistry of enzymes.

**CMB 715** – *Physical Biochemistry* (Spring semester, 2 credit hours)  
An introduction to physical biochemistry: a problem solving approach including statistics, thermodynamics, ligand binding, spectroscopy, fluorescence, centrifugation and separation techniques.

#### **C. Courses offered in even numbered academic years**

The courses in this year focus on fundamental topics in current cell and molecular biology.

**CMB 744** – *Cellular Biochemistry* (Spring semester, 6 credit hours)

An advanced course in covering multiple aspects of molecular and cellular biology including gene expression and its regulation, cell cycle, organelle function, signal transduction, intracellular transport, bioenergetics, and model genetic systems.

**CMB 742** – *Research Tools in Molecular Biology* (Spring semester, 3 credit hours)

An introduction to modern, fundamental laboratory methods including DNA cloning techniques.

#### D. Electives.

Courses offered by the other basic science departments at UMC may be taken as electives, and these courses will contribute to the minimum of 60 credit hours required to receive the Ph.D. The selection of these courses requires the approval of the Cell and Molecular Biology Program Director. Further information and detailed course descriptions of all graduate courses available at UMC are found in the [Bulletin of the University of Mississippi Medical Center](#). A listing of courses to be taught is provided by the office of Graduate Studies in the Health Sciences at the beginning of each academic year.

#### E. Seminar and research courses (all years)

Students are expected to participate in all departmental seminars (by faculty, students, or invited speakers), journal clubs and similar activities. Credit is given for satisfactory scholastic performance in seminars and for satisfactory research effort through the following courses:

**CMB 720** – *Journal club/Seminar* (1 credit hour per semester) This course is offered in the Fall and Spring semesters and is taken on a Pass/Fail basis. **See note below.**

**CMB 760** – *Cell and Molecular Biology Research* (1-9 credit hours per semester; Pass/Fail)

**CMB 798** – *Doctoral Dissertation Research and Preparation* (1 credit hour per semester; Pass/Fail)

**CMB 799** – *Master's Thesis Research and Preparation* (Maximum 6 credit hours; Pass/Fail)

#### F. Typical schedule and an example of credit hour accumulation

Course	Description	Credit Hours	When Taken	60 credit hours on 5 year schedule
CMB 710	Graduate Biochemistry	10	1 <sup>st</sup> Year, Fall	10
CMB 711	Mechanisms of Enzyme Action	2	Odd Years, Spring	2
CMB 715	Physical Biochemistry	2	Odd Years, Spring	2
CMB 740	Biochemical Methods	2	1 <sup>st</sup> Year, Fall	2
CMB 741	Advanced Biochemical Methods	1	1 <sup>st</sup> Year, Spring	1
CMB 742	Research Tools in Molecular Biology	3	Even Years, Spring	3
CMB 744	Cellular Biochemistry	6	Even Years, Spring	6
ID 709	Responsible Conduct of Research	2	1 <sup>st</sup> Year, Spring	2
ID 714	Professional Skills	3	2 <sup>nd</sup> Year, Spring	3
CMB 720	Journal club/Seminar	1	All years: Fall, Spring	10
CMB 760	Research	1-9	Summer, 1 <sup>st</sup> year, Fall, Spring, 2 <sup>nd</sup> year	Summer 1 <sup>st</sup> year: 5 Fall 2 <sup>nd</sup> year: 5 Spring 2 <sup>nd</sup> year: 5 Summer 2 <sup>nd</sup> year: 1 Fall 3 <sup>rd</sup> year: 1
CMB 798	Dissertation Research	1	Every Semester after Admission to Candidacy	4

### **Important information regarding CMB 720**

CMB 720 consists of journal club in the Fall semester and seminar in the Spring semester. In the Fall semester, all students are **REQUIRED** to take part in journal club discussions, including being the presenter for at least one session. For the Spring semester, all students in their G2 year or higher are **REQUIRED** to present a seminar to the Department. If the dissertation defense is scheduled in the Summer or Fall semesters, the student is **still required** to present a seminar to the Department during the Spring semester. *If these requirements are not met, the student will receive an incomplete for CMB 720 that will need to be cleared before the end of the subsequent Summer term. **If the student fails to complete the requirements before the end of the summer term, the incomplete grade will be replaced by a “fail.”***

Students in the G1 year are **REQUIRED** to give a 15 minute seminar to the Department in the Summer semester before the G2 year begins. Since students will have joined a research lab by this time, students are to give an overview of their work in the lab they have joined, and assess how this work fits into the overall research efforts explored in their lab.

### **2. Selection of a Research Advisor and a host laboratory**

New students are introduced to the Cell and Molecular Biology faculty and their research projects in the 1<sup>st</sup> year of the program through a system of seminars, classroom lectures, lab technique lectures and laboratory rotations. Beginning with the first semester students attend departmental seminars. Also in the first semester, faculty members demonstrate the advanced biochemical methods available in the department (**CMB 740**). Lab rotations (**CMB 741**) begin in the second half of the Fall semester and continue throughout the Spring semester.

Each rotation is 6 weeks in length and each student must rotate through a minimum of 3 different laboratories. Rotation schedules are coordinated through the Cell and Molecular Biology Program Director, but the students are responsible for contacting faculty to arrange rotations. By the end of the Medical Biochemistry class (CMB 710), first year students submit to the Program Director their list of the laboratories in which they have planned rotations and their desired order of rotation.

Students will be evaluated by the research advisor for each of the three laboratory rotations using the rubric shown in Appendix 3. After completion of all the laboratory rotations during the Spring semester, each first-year student is matched with a Research Advisor via a decision process that involves the student, the faculty member, the Department Chair and the Cell and Molecular Biology Program Director. Every effort is made to assign students to their first choice for their host laboratory, which is usually the case. Only faculty with a primary appointment in the Department of Cell and Molecular Biology are eligible for accepting rotation students and serving as the Research Advisor for students in the Cell and Molecular Biology Ph.D. program. Exceptions will be considered only in consultation with the Department Chair and Program director.

In some cases students will have entered the program with prior arrangements to work in a particular laboratory. These students will rotate through other laboratories as outlined above except by special exemption of the Program Director and the Department Chair. Each student begins research immediately after joining their host laboratory. At this point a major goal is developing their project to the point that they can prepare a successful Research Proposal by the beginning of their 3<sup>rd</sup> year. Throughout the student's training, from the G1 year until they graduate, presentation skills will be evaluated according to the metrics shown in Appendix 2. The goal of these evaluations is to provide constructive feedback to help the student become proficient when talking about science in front of others.

#### **A Change in Laboratory Status.**

On rare occasions, a student finds it necessary to move from one laboratory to another for either scientific or personal reasons. It is expected that such a decision will be well thought out and not capricious. To initiate the process, the student must discuss the reasons for the move with both the Cell and Molecular Biology Graduate Program Director and the Department Chair. The Program Director, the Department Chair, the student and the PI may discuss if a program of mediation might make the move unnecessary. If the student decides to leave the laboratory, the student may **not** formally commit to a new laboratory for a period of three months. During this time they may begin work in a new laboratory, or they may rotate through two laboratories. These plans will be made in consultation with the Graduate Program Director and the Department Chair. After this three month period, the student is expected to commit to a new laboratory. Any further decisions by the same student to change

laboratories will be dealt with on a case-by-case basis by the Department Chair and the Graduate Program Director. While the department will attempt to support all students during their education, there is no guarantee that a stipend will be available if a change of laboratory extends the time required to complete the student's dissertation research. If a PI wishes to ask a student to leave their laboratory, for scientific or personal reasons, the procedure described above will also apply. (Note the process must adhere to HR procedures.)

### **3. Graduate Advisory Committee**

After joining their host laboratory, and significantly before the Qualifying Examination of year 3, each student works with his Research Advisor to choose the members of the Graduate Advisory Committee. This committee consists of at least four members of the Cell and Molecular Biology graduate faculty, with the Research Advisor as Chair, plus one representative from another department or from another institution (Additional committee members from outside the department can be chosen if desired.). Normally, the committee members are chosen on the basis of knowledge or expertise related to the student's research project. The committee is formally constituted upon nomination by the Cell and Molecular Biology Program Director and appointment by the Graduate Council and Dean of the Graduate School. The Advisory Committee's functions include advising the student on research questions, their course plan, evaluating the student's progress and communicating this to the Program Director, conducting the oral Qualifying Examination, approving the form and content of the student's Dissertation and conducting the final Dissertation Defense. Each student meets with their Advisory Committee twice a year for an informal seminar and a review of progress. Overall academic performance and progress toward completion of all degree requirements will be monitored and documented utilizing the "Individual Student Progress Report Form" from the SGSHS to be completed twice annually (typically after the Fall and Spring semesters). In particular, research mentors are to provide feedback on page 8 of this form and assign a numerical grade to the student's progress according to the metrics shown in Appendix 3. Input from the Program Director will also be obtained.

### **4. Written Comprehensive Examination.**

The comprehensive examination is given at the end of the Spring semester of the 2<sup>nd</sup> year. The purpose of this examination is to measure student comprehension of basic principles in a number of areas of cell and molecular biology. Questions are primarily drawn from the topics presented in CMB 710, 711, 715, 742, 743 and 744 as well as material presented in journal clubs (CMB 720) and departmental seminars. Students are expected to integrate all of this knowledge.

Questions are prepared and graded under the direction of the Qualifying Examination Committee, which consists of two faculty members plus a senior graduate student. Each faculty member submits questions for the exam. The exam is given over 2 days after Spring semester (usually in June) of the 2<sup>nd</sup> year. Time is limited to 8 hours for each day. The answers should be organized, clearly written and focused, with convincing arguments. Answers are graded by the author of the question with a final evaluation by the Qualifying Examination Committee. Scoring follows the rubric shown in Appendix I. A student will receive an unconditional pass for the Written Comprehensive Examination if they obtain a score of  $\geq 2.0$  on all questions AND an overall average  $>3.0$ . If a student receives a score of  $<3.0$  on a single question, remediation on that topic may be required, as determined by the examination committee in consultation with the author of the question. If a student receives a score of  $\leq 2.0$  on a single question, remediation on that topic will be required, as determined by the examination committee in consultation with the author of the question. Three (3) scores of  $<2.0$  will require formal re-examination on those subjects. Four (4) scores of  $<2$  will require formal re-examination for all subjects. If all scores are  $\geq 2.0$  but the overall average is between 2.5 & 3.0, the student will be re-examined on all sections for which the score was  $<3.0$ . If all scores are  $\geq 2.0$ , but the examination average is  $<2.5$ , the entire examination must be re-taken. Remediation and re-examination must be completed by the beginning of the Fall term for the student to be eligible to continue work on the Ph.D. degree. Grades received upon re-examination become the grade of record. Should a student fail re-examination, the student will be given the option to remain in the graduate program for an additional year to pursue a M.S. degree with thesis. However, the department cannot guarantee that a stipend will be available for such students. Only after completing the requirements of the M.S. degree, may a student apply for readmission to the Ph.D. degree program. Before re-admission to the Ph.D. program, the student must pass the Comprehensive Examination.

## **5. Preparation of the Research Proposal and submission of application for funding.**

At the beginning of the 3<sup>rd</sup> year, or sooner, each student prepares an original research proposal outlining the research to be conducted for their Dissertation and publications. This proposal provides the focus for the Oral Qualifying Examination, which leads to Candidacy. The proposal is prepared in the form of NIH fellowship grant proposals, and should include the following sections.

Abstract

Specific Aims (1/2 to 1 page with flow diagram of hypothesis)

Significance

Innovation

Approach

Timetable for publication of first-author paper and for completion of project (0.5 to 1 page)

Literature Cited (no limit)

The length of the Significance, Innovation and Approach section of the proposal should not exceed 6 pages in accordance with the page limits for NIH F31 applications. The document should be single spaced, with 0.5 inch margins and a 11 point font with spacing set to "exactly". Figures and tables should be embedded. The Timetable should address the plan for the student's first "first author" publication, unless this requirement has already been satisfied. The Research Proposal should be delivered to all of the members of the Graduate Advisory Committee a minimum of two weeks before the Qualifying Examination.

The Research Proposal is not a contract for work to be performed in order to receive the Ph.D because change is an inherent characteristic of the process of research. Research progress toward the Ph.D. is primarily determined by the student and their Research Advisor, with input from the student's Graduate Advisory Committee, the Cell and Molecular Biology Program Director and the Department Chair. The student is **REQUIRED in the G3 year** to develop the Research Proposal into an application for predoctoral funding.

## **6. Oral Qualifying Examination.**

This examination is scheduled by the student, who is responsible for finding a time in for which all of the committee members can attend. The student should consult about the date of the examination with the Cell and Molecular Biology Program Director, who has the responsibility of notifying the Dean of the Graduate School. The examination should take place during the Spring term of the student's 3<sup>rd</sup> year. Later scheduling of the exam requires justification to the Department Chair and the Cell and Molecular Biology Program Director.

To begin the Qualifying Examination, the student presents a one-hour public research seminar on their research project. The seminar is immediately followed by a meeting of the student with their Graduate Advisory Committee. During this meeting/examination the Advisory Committee will seek to determine the student's capability to carry out the proposed research. A particular focus will be the student's plans and progress toward the first publication. At the completion of this meeting the Committee members vote to determine if the student has passed the examination; if so, the student is ready to advance to Candidacy. Any member of the Cell and Molecular Biology graduate faculty may participate in this meeting as a nonvoting attendee, although this is unusual. Outright failure of the Qualifying Examination leads to dismissal from the Graduate Program, but this is rare. More common is the recognition by the committee of specific deficiencies in required knowledge or in the Research Proposal. In these cases, the Committee makes passage of the examination provisional upon specified pathways of remediation. The time frame to complete these requirements will be specified by the committee.

## **7. Residence Requirements**

A minimum of three academic years of full-time enrollment is required to earn the Ph.D. degree. At least four academic semesters must be spent in continuous residence at the University of Mississippi Medical Center. Full academic years of residence are years during which a student is devoting full-time to graduate study and research. This requirement may be met by enrollment in CMB 798 for at least 1 hour. In most instances, completion of the Ph.D. program requires four or more years.

In an academic semester, a student must register for 9 or more credit hours to qualify as full-time student. In a summer semester, a student must be registered for one or more credit hours.



However, after advancement to candidacy, a student working full-time on his/her dissertation research or writing is considered a full-time student. In this case, enrollment in only one credit hour constitutes full-time enrollment. Although university regulations state that the summer semester may be included in, or excluded from, the continuity of the residence period, it is departmental policy that all summers be used as periods of full-time research effort. Therefore, the first two academic years are normally used to fulfill the continuous residence requirement.

### **8. Publication Requirement**

As discussed above, part or all of the student's dissertation research must be published or accepted for publication in a national/international scientific journal with a peer review policy before the Ph.D. is awarded. This manuscript must meet the publication requirement, i.e., the student must be listed as the **sole first author** on at least one original research and/or scholarship publication in a national or international peer-reviewed journal.

### **9. Dissertation and the Dissertation Defense**

A Ph.D. dissertation must show originality and power of independent investigation and embody results of research that form a contribution to scientific knowledge. It must also exhibit the student's mastery of the literature of the subject. The presentation of the material must demonstrate an appreciable level of literary skill.

The dissertation is written in accordance with the form described in the Guide for Graduate Students and is prepared under the direction of the student's Research Advisor. Subsequently, the dissertation must be approved by the candidate's Graduate Advisory Committee, the Cell and Molecular Biology Program Director and the Graduate Council. If a student plans to complete his/her degree in the Spring semester, the dissertation must be approved by all parties, as well as the Graduate Studies in the Health Sciences, at least one month before the date for conferring degrees. Binding, microfilm and copyright fees must be paid to the Student Accounting Office before the final oral examination.

This examination constitutes the required public defense of the research dissertation. The examination consists of a public departmental seminar presentation during and after which the candidate answers questions from the audience concerning his research. Subsequently, the student's Graduate Advisory Committee conducts a private, more detailed examination of the dissertation. The dissertation must be submitted to all members of the Advisory Committee and Cell and Molecular Biology Program Director at least two weeks prior to the scheduled final oral examination.

## **VI. REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE**

The M.S. degree requires a one year residence, 30 credit hours of formal course work, a research thesis and a final oral examination. A complete description of the requirements is found in the Bulletin of the University of Mississippi Medical Center.

## **VII. REQUIREMENTS FOR THE M.D./ Ph.D. PROGRAM**

The University of Mississippi Medical Center offers to advanced students the opportunity to pursue both the M.D. and Ph.D. degrees in a special program that would normally extend the M.D. program from four years to, on the average, seven years. The School of Medicine and the Ph.D. degree govern the regulations and requirements for the M.D. program by the Graduate School. The Bulletin of the University of Mississippi Medical Center briefly describes the requirements and general course of study for the M.D./Ph.D. program. Specific courses and examinations are set by the individual Departments consistent with their normal requirements for Graduate study, although the timing and placement of specific requirements may be tailored to the special program of the M.D./Ph.D. students. The current arrangement of this program is 3 years in Medical School, 3 years in Graduate School, then 1 year in Medical School (3,3,1).

Upon expressing an interest in pursuing the Ph.D. degree in Cell and Molecular Biology, the student should contact the departmental Cell and Molecular Biology Program Director in order to arrange interviews with faculty who are interested in accepting an M.D./Ph.D. Student in their laboratory. As stated in the Bulletin of the University of Mississippi Medical Center, the choosing of a Research Advisor must be completed by the end of the M3 year. However, the student is strongly encouraged to do this as early as feasible in order that the laboratory training may begin.

After completion of the M3 year the student is expected to begin research in the laboratory into which they have been accepted. Each student, in consultation with their Research Advisor and the

departmental Cell and Molecular Biology Program Director, should form a Research Advisory committee in the Fall Semester of their G1 year. In this semester, the student will enroll in Cell and Molecular Biology Research (CMB 760).

The didactic course requirements for students enrolled in the M.D./Ph.D. program will be individually tailored taking into consideration the type of research work in which the student will be engaged. A course plan shall be established at the beginning of the G1 year in consultation with the student's Research Advisory Committee and the Cell and Molecular Biology Program Director. Each student will be required to take a minimum of 2 academic semesters of advanced graduate courses within the department. *These may be any 8 of the 16 hours offered.* Because the graduate courses are taught on a rotation of every other year, some students may complete their course work within the G1 year, while the schedule for others may carry over into the G2 year. In addition, students are expected to attend all Departmental seminars and to participate in the Journal Club/Seminar.

By the end of the Fall Semester of the G1 year, students will be expected to complete the Oral Qualifying Examination. The Written Comprehensive Examination will take place at the end of June of the year in which the student has fulfilled their course requirements. If a passing grade is not obtained, the student will be allowed to retake the exam again in 6 months.

Presentation of the Dissertation Proposal should be completed no later than the end of the Fall of the G2 year. Thus, by the end of the G2 year the student is expected to advance to Candidacy. Deficiencies must be resolved by the Spring Semester of the G3 year. By the end of the G3 year the student is expected to fulfill most of the requirements for the Ph.D. degree. If required, the Dissertation and final oral examination may be completed as late as the end of the M4 year.

## Appendix 1

### Written Comprehensive Examination: Assessment of Individual Questions

Student name: \_\_\_\_\_

Name of Evaluator: \_\_\_\_\_ Date of evaluation: \_\_\_\_\_

Curriculum focus of the question (*e.g.*, **Molecular Biology from Research Tools and Cellular Biochemistry**):

\_\_\_\_\_

Answers are assessed on a 0-5 point scale as follows: **5, Exceptional; 4-4.9, Excellent; 3-3.9, Fair; 2-2.9, More correct than incorrect, but deficient; 1-1.9 Incorrect; 0-0.9, Severe deficiencies** The letter grade equivalents of these scores are: A=4-5; B=3–3.9; C=2–2.9; F is less than 2.0.

<b>Criteria to assess</b>	<b>Score (0-5)</b>
For each of the following assess the performance level of the student:.	
The student has correctly interpreted the question.	
A correct answer is provided. The answer is neither vague nor contradicted by other statements.	
The answer includes convincing arguments for each component of the question.	
The answer demonstrates the biochemical expertise expected by the question.	
The answer does not include extraneous or incorrect statements.	
The answer is readable, clearly articulated, and follows a logical progression. If diagrams are included, they are correctly drawn and the labeling is clear and correct.	
Overall Grade (this is <b>not</b> an average of the above; it should reflect your overall assessment of the answer to your question.):	

Additional Comments:

**Appendix 1b**

**Summary of Written Comprehensive Examination Scores**

Student Name: \_\_\_\_\_

Primary Faculty Member	Question Topic (may vary from year to year)	Score	Letter Grade	Date of remediation or re-examination	Remediation or re-examination Score	Remediation or re-examination Letter Grade
Gibert	Genetic models of disease					
Brown	Chromatin					
Correia	Biophysics					
Hebert	Nuclear organization					
Hosler	Bioenergetics/Enzymology					
Maranon	Nicotine, sex steroids, adipocytes, and hypertension					
Raucher						
Reckelhoff	Sex differences in blood pressure control/ Postmenopausal hypertension					
Romero	Cell biology/Signaling					
Wirschell	Cytoskeleton/Molecular Biology					
Yanes	Androgens and cardiometabolic complications					
Logue						
	Average					

Comments:

Remediation required:

Date Remediation Completed: \_\_\_\_\_

Results Verified by **Written Comprehensive Examination Committee:**

Committee Representative: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

**Appendix 2**

**Criteria for Evaluating Student Oral Presentations**

Student name: \_\_\_\_\_ Date of evaluation: \_\_\_\_\_ Course description: \_\_\_\_\_

Faculty name: \_\_\_\_\_ Faculty signature: \_\_\_\_\_

Please use the following 5 point grading scale: 5. exceeds highest expectations; 4. Greater than 90% of the objective is achieved; 3. Greater than 80% of the objective achieved; 2. Does not meet the level of completeness or correctness required of a graduate student; 0-1. Less than 70% of the objectives met.

Category	Score
<b>A. COMMUNICATION SKILLS</b>	
1. Was the student adequately prepared to begin the presentation?	
2. Were the slides clearly and professionally prepared?	
3. Was the content well organized with a proper introduction, explanation of abbreviations or acronyms, and clear summation of the information?	
4. Did the student demonstrate adequate familiarity with the article and content of figures and legends?	
5. Did the student maintain eye contact with the audience, present in a confident demeanor and clearly deliver the material?	
6. In response to questions, did the student maintain focus on the subject with a logical flow of information and provide answers that were clear and pertinent?	
7. Were the number of slides and amount of information appropriate for the subject scope and the allotted time?	
<b>Communication Skills, Average =</b>	
<b>B. UNDERSTANDING BASIC PRINCIPLES OF CELL AND MOLECULAR BIOLOGY AND CMB LITERATURE</b>	
1. Did the student accurately represent the key findings of the paper(s) presented?	
2. Did he/she identify strengths or weaknesses in the work chosen for presentation?	
3. Were the experimental methods and results clearly described?	
4. Were the hypotheses clearly described and the data summarized in support of the hypothesis?	
5. Did the presentation and response to questions demonstrate an adequate knowledge of the literature?	
6. Were questions answered based on sound scientific principles and consistent with the data?	
<b>Understanding Basic Biochemical Principles and Literature, Average =</b>	
<b>C. PRESENTATION OF RESEARCH</b>	
1. Did the student provide a clear rationale for their own research project?	
2. Were the hypotheses clearly stated and did the data support the hypotheses?	
3. Were hypotheses and conclusions based on sound scientific principles and consistent with the data?	
4. Was it clear where the student provided intellectual input and was provided independent thought for planning the direction of the research?	
5. Were directions for future research identified?	
6. Did answers to question demonstrate the student's understanding of the research area and related literature?	
<b>Presentation of Research, Average</b>	
<b>Overall Average =</b>	

**Appendix 3**

**Cell and Molecular Biology  
Graduate Student Research Evaluation**

Student Name: \_\_\_\_\_ Year started program: \_\_\_\_\_

Academic quarter of evaluation: \_\_\_\_\_

Advisor name: \_\_\_\_\_ Date of evaluation: \_\_\_\_\_

Overall evaluation:

A = 90-100; B = 80-89; C = 70-79; F is less than 70.

	<b>Maximum Points</b>	<b>Points Earned</b>
Quality of work	15	
Quantity of work	15	
Initiative	15	
Independent thought	15	
Dependability	15	
Lab notebook	25	
Net Points:	100	
Letter Grade:		

Narrative evaluation:

Suggestions for improvement:

Other comments:

Student's Comments:

Advisor signature: \_\_\_\_\_ Date: \_\_\_\_\_

Student signature: \_\_\_\_\_ Date: \_\_\_\_\_

**Cell and Molecular Biology  
Dissertation Defense – Written**

Date \_\_\_\_\_

Student : \_\_\_\_\_

Dissertation Title: \_\_\_\_\_

Evaluator : \_\_\_\_\_ Affiliation: \_\_\_\_\_

Please use the following 5 point grading scale:

5. exceeds highest expectations;
4. Greater than 90% of the objective is achieved;
3. The expected level of performance with greater than 80% of the objective achieved;
2. Does not meet the level of completeness or correctness required of a graduate student;
- 0-1. Less than 70% of the question objectives met.

Letter grades will be assigned: A=4 or above; B=3 – 3.9; C=2 – 2.9; F is less than 2.0.

Evaluation Criteria	Grade (0-5)
<b>Communication:</b> Student summarizes findings, presents strengths and weaknesses and effectively communicates findings	
<b>Use of Scientific Literature:</b> Student effectively cites pertinent sources and integrates findings into body of scientific research	
<b>Knowledge of Discipline:</b> Student demonstrates a comprehensive knowledge of field	
<b>Knowledge of Specialized Research Techniques:</b> Student understands the scientific significance of their work and demonstrates a compelling argument for hypotheses	
<b>Research Methods:</b> Student demonstrates use of methodology appropriate for research questions and of sufficient rigor to support conclusion	
<b>Overall Evaluation of Dissertation:</b>	
<b>Additional Comments:</b>          	

**Assessment  
Cell and Molecular Biology  
Dissertation Proposal**

Date \_\_\_\_\_

**Student** : \_\_\_\_\_

**Proposed Title:** \_\_\_\_\_

**Evaluator** : \_\_\_\_\_

**Affiliation:** \_\_\_\_\_

Please use the following 5 point grading scale:

5. exceeds highest expectations;
4. Greater than 90% of the objective is achieved;
3. The expected level of performance with greater than 80% of the objective achieved;
2. Does not meet the level of completeness or correctness required of a graduate student;
- 0-1. Less than 70% of the question objectives met.

Letter grades will be assigned: A=4 or above; B=3 – 3.9; C=2 – 2.9; F is less than 2.0.

Assessment Criteria	Grade (0-5)
<b>Significance:</b> Proposal clearly identifies and defines importance of hypotheses being tested.	
<b>Literature Review:</b> Recognizes important unanswered questions based on review of literature	
<b>Approach:</b> The project is well developed and realistic	
<b>Methods:</b> The study design provides significant evidence of ability conduct to independent research and interpret results	
<b>Critical Skills:</b> Proposal demonstrates student has accomplished the critical skills necessary to perform meaningful research	
<b>Research Standards:</b> Student recognizes importance of IRB procedures and has met standards for working with human research subjects	