

# BACHELOR OF ARTS (BA) DEGREE / MASTER OF SCIENCE (MS) DEGREE / DOCTOR OF PHILOSOPHY (PHD) DEGREE IN THE FIELD OF BIOCHEMISTRY AND CELL BIOLOGY

## Program Learning Outcomes for the BA/MS/PhD Accelerated Degree Program in the field of Biochemistry and Cell Biology

Upon completing the Bachelor's degree requirements for this program, students majoring in Biosciences will be able to:

1. Demonstrate a comprehensive knowledge of biology with particular emphasis on biochemistry, genetics, and cell biology.
2. Demonstrate the ability to apply the modern scientific method, including designing experiments and/or building mathematical models, and collecting, analyzing, and interpreting data using common statistical methods and software programs.
3. Demonstrate effective oral and written communication skills, including an ability to communicate effectively and work with diverse groups, and the ability to interpret and communicate the results of original research.
4. Locate primary scientific literature and demonstrate the ability to use critical thinking and problem-solving skills to evaluate published and proposed research in the biological sciences and to apply these skills.
5. Demonstrate understanding of the practice and culture of science, scientific ethics, and the relationship between science and society.
6. Develop quantitative reasoning via the construction of models and/or the analysis of data.

Students completing the MS degree requirements will be able to:

1. Develop a knowledge of past and current research accomplishments and techniques in biochemistry and cell biology.
2. Demonstrate problem solving and critical thinking skills.
3. Demonstrate the effective written, oral, and visual communication skills required to articulate scientific findings and significance via a thesis describing independent research, publishable research, and seminars.

Students completing the PhD degree requirements will be able to:

1. Develop a comprehensive knowledge of current and past research accomplishments and techniques in biochemistry and cell biology.
2. Demonstrate independent problem solving and critical thinking skills.
3. Demonstrate the effective written, oral, and visual communication skills required to articulate scientific findings and significance via a thesis describing independent research, publications, and seminars.

## Requirements for the BA/MS/PhD Accelerated Degree Program in the field of Biochemistry and Cell Biology

### BA in Biosciences Requirements

All of the requirements for a BA Degree with a Major in Biosciences

- and a [Major Concentration in Biochemistry](https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/biochemistry-ba/#requirementstext) (<https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/biochemistry-ba/#requirementstext>),<sup>1</sup> **or**
- and a [Major Concentration in Cell Biology and Genetics](https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/cell-biology-and-genetics-ba/#requirementstext) (<https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/cell-biology-and-genetics-ba/#requirementstext>),<sup>1</sup> **or**
- and a [Major Concentration in Integrative Biology](https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/integrative-biology-ba/#requirementstext) (<https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/integrative-biology-ba/#requirementstext>)<sup>1</sup>

are required for the BA/MS/PhD accelerated program.

### MS in Biochemistry and Cell Biology Requirements

The BA/MS/PhD Committee will advise students pursuing the BA/MS completion and will approve their formal course program during their final two years in the BA/MS program. Students who wish to pursue the BA/MS program must select the MS thesis advisor by the end of their second year, when they declare their major, to provide the opportunity to begin a project that will form the basis of the MS thesis.

Course requirements for the MS degree include:

Code	Title	Credit Hours
<b>Core Requirements</b> <sup>2</sup>		
BIOS 581	GRADUATE SEMINAR IN BIOCHEMISTRY AND CELL BIOLOGY (fall semester)	2
BIOS 582	GRADUATE SEMINAR IN BIOCHEMISTRY AND CELL BIOLOGY (spring semester)	1
BIOS 583	MOLECULAR INTERACTIONS	4
BIOS 587	RESEARCH DESIGN, PROPOSAL WRITING, AND PROFESSIONAL DEVELOPMENT	3
BIOS 800	BIOCHEMISTRY & CELL BIOLOGY GRADUATE RESEARCH	1-15
UNIV 594	RESPONSIBLE CONDUCT OF RESEARCH	1
<b>Elective Requirements</b>		
<i>Select at least 6 credit hours from departmental (BIOS) course offerings at the 500-level (or select other coursework at the 500-level with departmental approval)</i>		6
<b>Additional Coursework as Approved by Department</b>		
<b>Total Credit Hours</b> <sup>2</sup>		<b>Minimum of 40</b>

## Footnotes and Additional Information

- <sup>1</sup> Students who matriculated prior to academic year 2020-2021 may complete the BA degree a Major in Biosciences choosing one of the three major concentrations listed above (a Major Concentration in Biochemistry, or a Major Concentration in Cell Biology and Genetics, or a Major Concentration in Integrative Biology), or they may meet the requirements by completing the BA degree with a major in Biochemistry and Cell Biology (offered prior to academic year 2020-2021).
- <sup>2</sup> Safety training in Environmental Health and Safety is required before entry into the laboratory, and training in responsible conduct of research (UNIV 594) is taken during the freshmen or sophomore year. The courses listed must be completed or evidence provided of successful completion of courses that covered the same material with a B- grade average (GPA  $\geq$  2.67). Students in the BA-MS track are required to register for and participate in BIOS 581 or BIOS 582 both semesters during their junior and senior years and to present their research at least once. Students generally enroll in at least 9 credit hours of BIOS 800 during the summer between the sophomore and junior year, BIOS 587 and up to 6 credit hours of BIOS 800 during the summer between the junior and senior years. Students take BIOS 583 and BIOS 588 in their senior year. Registration for at least 9 credit hours of BIOS 800 is required during the summer following the senior year for MS thesis defense. Undergraduates who are on financial aid must register for at least 12 credit hours that will be applied to the undergraduate transcript each semester to maintain full-time status.

Students will be responsible for the content of these courses in their MS defense (which also serves as the Admission to PhD Candidacy examination).

Progress reviews with the MS thesis committee occur at the end of the junior year and the early spring of the senior year. Students who wish to continue to the PhD after the MS should include a section on their proposed PhD research project in the senior year progress review, indicating their future goals and aims. This future work section should also be included in the MS thesis and may be part of the discussion with the thesis committee following the defense. The MS thesis will be submitted and public oral defense will occur in the summer following graduation at the end of the senior year with completion of the BA requirements. MS candidates continuing to the PhD must maintain a GPA  $\geq$  3.00, complete a thesis, and make a public oral defense that includes a private examination by their MS thesis committee. Students who complete the MS requirements with a GPA  $\geq$  2.67 but less than 3.00 must defend their thesis to complete the MS degree, but will not be admitted to the PhD program.

## PhD in Biochemistry and Cell Biology Requirements

The following are required for admission to the PhD portion of the BA/MS/PhD accelerated program: Successful completion of the MS thesis and oral defense, which will serve as the admission to candidacy examination for all PhD candidates in this program, an overall GPA  $\geq$  3.00 for the BA-MS degree courses. Students who are in good academic standing in the BA/MS portion and have passed their MS final oral examination may begin their doctoral studies the summer following graduation with the approval of their PhD mentor and the Department Chair.

Course requirements for the completion of the PhD studies within the accelerated BA/MS/PhD program include all of the required courses taken during the MS studies and the following:

Code	Title	Credit Hours
<b>Core Requirements</b>		
BIOS 581	GRADUATE SEMINAR IN BIOCHEMISTRY AND CELL BIOLOGY (required in all fall semesters of residency) <sup>1</sup>	Minimum of 2 credit hours
BIOS 582	GRADUATE SEMINAR IN BIOCHEMISTRY AND CELL BIOLOGY (required in all spring semesters of residency) <sup>1</sup>	Minimum of 2 credit hours
BIOS 599	GRADUATE TEACHING IN BIOCHEMISTRY AND CELL BIOLOGY <sup>2</sup>	Minimum of 2 credit hours
BIOS 800	BIOCHEMISTRY & CELL BIOLOGY GRADUATE RESEARCH (minimum of 45 credit hours taken over 2 academic years and 1 summer) <sup>3</sup>	Variable credit hours
<b>Total Credit Hours *</b>		<b>Minimum of 60</b>

## Footnotes and Additional Information

- \* A minimum of 60 credit hours beyond the MS is required for the PhD. BIOS 611 *Research Seminar* and other 500-level courses as approved by the research advisor can be counted toward the 60 hours total.
- <sup>1</sup> PhD students are required to enroll in BIOS 581 (fall semester) or BIOS 582 (spring semester) during all semesters of residency. A minimum of 4 credit hours of BIOS 581 and BIOS 582 combined are required.
- <sup>2</sup> BIOS 599 provides PhD students with teaching experience by serving as discussion leaders and grades in two undergraduate courses, and additional teaching experiences are available on an optional basis. Students will take BIOS 599 following the master's defense, with the precise time determined with input from the graduate advising committee.
- <sup>3</sup> BA/MS/PhD students are required to enroll in 15 credit hours each semester after they have defended the master's degree, including summer semesters, to reflect their full-time status. After enrolling in any other required courses, students should enroll in the number of hours of BIOS 800 such that their total credit hours equal 15.

## Evaluation of Progress in the PhD Phase of the BA/MS/PhD Program

The Graduate Advisory Committee evaluates each student's record and recommends any further coursework based on the requirements and on the interests of the student. Thesis advisors may require additional courses. At the end of each semester, the department chair, in consultation with the faculty, reviews student performance in the formal coursework. Students must maintain at least a B grade average (GPA  $\geq$  3.00), perform satisfactorily in their research efforts, and demonstrate outstanding motivation and potential for research.

Evaluation during the PhD phase of the program includes:

- The MS thesis and its oral defense constitute the admission to candidacy examination

- Ongoing review of research progress by the thesis advisor; satisfactory research progress will be indicated by a grade of "S" in BIOS 800 each semester
- A yearly research progress assessment by the student's Research Progress Review Committee
- Presentation of research progress at least once a year in seminar format (BIOS 581 or BIOS 582) starting in the first year of PhD study and continuing until submission of the doctoral thesis
- Defense of the PhD thesis research and text in a final public seminar presentation and oral examination attended by the student's Thesis Committee

## Policies for the BA/MS/PhD Accelerated Degree Program in the field of Biochemistry and Cell Biology

### Biochemistry and Cell Biology Graduate Program Handbook

The General Announcements (GA) is the official Rice curriculum. As an additional resource for students, Biochemistry and Cell Biology publishes a graduate program handbook, which can be found here: [https://gradhandbooks.rice.edu/2020\\_21/Biochemistry\\_Cell\\_Biology\\_Graduate\\_Handbook.pdf](https://gradhandbooks.rice.edu/2020_21/Biochemistry_Cell_Biology_Graduate_Handbook.pdf)

### Admission

Qualified Rice University undergraduates can apply to enroll in the Biochemistry and Cell Biology BA/MS/PhD accelerated program in the spring of their sophomore year. Students who are strong candidates for this program typically join a Rice research lab to start research on a project with one of the Biochemistry and Cell Biology Graduate Program research faculty as advisor prior to applying. Upon acceptance, depending on course load, financial aid status, and other variables, program participants may then start taking required graduate course requirements at the same time as their upper-level undergraduate degree course requirements. Students pursuing this program should be aware that there could be financial aid implications, should the conversion of undergraduate coursework to that of graduate level reduce their earned undergraduate credit for any semester below that of full-time undergraduate status (12 hours). Advisors for the program can assist in this determination.

Laboratory research performed in undergraduate and graduate research courses is presented as the MS thesis in the summer following graduation and provides the basis for the PhD thesis work. As a result, the graduate careers of these students will be accelerated by an anticipated 1-2 years, and such students may be able to obtain their PhD degree approximately 3 years after obtaining their BA/MS degrees. If circumstances require, students may stop at the BA or MS level if they meet all the requirements for the respective degrees.

Criteria for selection include academic performance (GPA  $\geq$  3.50), motivation, previous research experience, and personal qualities. Enrollment is limited, and the Biochemistry and Cell Biology BA/MS/PhD Committee will select applicants for admission.

### Transfer Credit

For Rice University's policy regarding transfer credit, see [Transfer Credit](https://ga.rice.edu/graduate-students/academic-policies-procedures/regulations-procedures-all-degrees/#transfer) (<https://ga.rice.edu/graduate-students/academic-policies-procedures/regulations-procedures-all-degrees/#transfer>). Some departments and programs have additional restrictions on transfer credit. Students

are encouraged to meet with their academic program's advisor when considering transfer credit possibilities.

### Departmental Transfer Credit Guidelines

Students pursuing the BA/MS/PhD accelerated degree program in the field of Biochemistry and Cell Biology should be aware of the following departmental transfer credit guidelines:

- Requests for transfer credit will be considered by the program director (and/or the program's official transfer credit advisor) on an individual case-by-case basis.

### Additional Information

For additional information, please see the BioSciences website: <https://biosciences.rice.edu/>.

## Opportunities for the BA/MS/PhD Accelerated Degree Program in the field of Biochemistry and Cell Biology

Information about Student Resources, Attendance at Scientific Conferences, Internships, Graduate Student Awards, the Graduate Student Association, etc. can be found in the Biochemistry and Cell Biology Graduate Program Handbook: [https://gradhandbooks.rice.edu/2020\\_21/Biochemistry\\_Cell\\_Biology\\_Graduate\\_Handbook.pdf](https://gradhandbooks.rice.edu/2020_21/Biochemistry_Cell_Biology_Graduate_Handbook.pdf) ([https://gradhandbooks.rice.edu/2020\\_21/Biochemistry\\_Cell\\_Biology\\_Graduate\\_Handbook.pdf](https://gradhandbooks.rice.edu/2020_21/Biochemistry_Cell_Biology_Graduate_Handbook.pdf))

### Additional Information

For additional information, please see BioSciences website: <https://biosciences.rice.edu/>.