**Disclaimer:** The 2022-23 Purdue West Lafayette catalog is considered the source for academic and programmatic requirements for students entering programs during the Fall 2022, Spring 2023, and Summer 2023 semesters. The Program Progression Guide assists students in the development of an individualized 8-semester plan. Students are encouraged to use this guide, MyPurduePlan* (online degree auditing tool) and the Student Educational Planner (SEP) as they work with their academic advisor towards the completion of their degree requirements.

**Notification:** Each student is ultimately responsible for knowing, monitoring and completing all degree requirements.

An undergraduate degree in the College of Science requires completion of the following degree requirements.

<table>
<thead>
<tr>
<th>University Degree Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum 2.0 Cumulative GPA</td>
</tr>
<tr>
<td>Minimum 120 Credits that fulfill degree requirements</td>
</tr>
<tr>
<td>32 Residency Credits (30000-level and above) at a Purdue University campus</td>
</tr>
</tbody>
</table>

**University Core Curriculum**

https://www.purdue.edu/provost/students/s-initiatives/curriculum/courses.html

- Human Cultures: Behavioral/Social Science
- Human Cultures: Humanities
- Information Literacy
- Oral Communication
- Quantitative Reasoning
- Science
- Science, Technology & Society Selective
- Written Communication

**Civic Literacy Proficiency**

https://www.purdue.edu/provost/about/provostinitiatives/civics/

**Required Major Program Courses (see following pages)**

Departmental specific requirements, including 2.0 average GPA in classes required to fulfill biology requirements.

Minimum 2.0 cumulative GPA

Must have a 500-level BIOL course (3-credit BIOL lecture)

**College of Science Core Curriculum**

https://www.purdue.edu/science/Current_Students/curriculum_and_degree_requirements/college-of-science-core-requirements.html?

- Freshman Composition – 3 credits
- Technical Writing and Presentation - 3 credits
- Teaming & Collaboration (NC)
- General Education - 9 credits
- Foreign Language & Culture – 9 credits
- Great Issues - 3 credits
- Laboratory Science - 8 credits
- Multidisciplinary - 3 credits
- Mathematics - 6-10 credits
- Statistics - 3 credits
- Computing - 3 credits

**Degree Electives**

Any Purdue or transfer course approved to meet degree requirements in accordance with individual departmental policies. Consult the [No Count Course List](#) for courses which may not be used to meet any College of Science degree requirement.

* This audit is not your academic transcript and it is not official notification of completion of degree or certificate requirements.

** University Core Curriculum Outcomes may be met through completion of the College of Science Core curriculum. Students should consult with their academic advisors and MyPurdue Plan for course selections.
# 2022-23 Cell, Molecular, and Developmental Biology Degree Progression Guide

The Department of Biological Sciences has suggested the following degree progression guide for the Cell, Molecular, and Developmental Biology Degree. Students will work with their academic advisors to determine their best path to degree completion. Course pre-requisites are specific to this degree plan.

<table>
<thead>
<tr>
<th>Credit</th>
<th>Fall 1st Year</th>
<th>Prerequisite</th>
<th>Credit</th>
<th>Spring 2nd Year</th>
<th>Prerequisite</th>
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<tbody>
<tr>
<td>2</td>
<td>BIOL 12100</td>
<td></td>
<td>3</td>
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</tr>
<tr>
<td>5</td>
<td>CHM 12901</td>
<td>ALEKS 85 or Calc Placement</td>
<td>4</td>
<td>CHM 25500 - 25501</td>
<td>CHM 12901</td>
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<tr>
<td>2</td>
<td>BIOL 13500 or 19500</td>
<td>CHM 12901 co-req</td>
<td>3-5</td>
<td>Calculus II selective</td>
<td>C or better in all prior CHM courses</td>
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<tr>
<td>3-5</td>
<td>Calculus I selective</td>
<td>ALEKS 75 or 85</td>
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<td>3</td>
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<td>BIOL 12100 co-req</td>
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<td>Science Core Option</td>
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</tr>
<tr>
<td>1</td>
<td>Elective (BIOL 11500 pref.)</td>
<td></td>
<td>16-18</td>
<td>16-19</td>
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<table>
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<tr>
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<th>Prerequisite</th>
<th>Credit</th>
<th>Spring 2nd Year</th>
<th>Prerequisite</th>
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<tbody>
<tr>
<td>3</td>
<td>BIOL 23100</td>
<td>BIOL 13100 and co-req CHM 12901</td>
<td>3</td>
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<td>BIOL 23100</td>
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<tr>
<td>2</td>
<td>BIOL 23200</td>
<td>Co-req BIOL 23100</td>
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<td>BIOL 24200</td>
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<tr>
<td>4</td>
<td>CHM 25600 and CHM 25601</td>
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<td>CHM 33900</td>
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<td>CHM 33901</td>
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<td>2</td>
<td>BIOL 28600</td>
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<tr>
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<td>Elective (BIOL 29300 pref)</td>
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<table>
<thead>
<tr>
<th>Credit</th>
<th>Fall 3rd Year</th>
<th>Prerequisite</th>
<th>Credit</th>
<th>Spring 3rd Year</th>
<th>Prerequisite</th>
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<tr>
<td>3</td>
<td>Intermediate Biology Selective</td>
<td>BIOL 23100 and 24100</td>
<td>3</td>
<td>Cell/Molecular/Develop Selective I</td>
<td>BIOL 23100 and 24100</td>
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<tr>
<td>4</td>
<td>PHYS I Selective</td>
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<td>PHYS II Selective</td>
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<td>3</td>
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<td>3-4</td>
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<tr>
<td>3</td>
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<tr>
<td>3</td>
<td>Elective</td>
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<td>Elective</td>
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</tr>
<tr>
<td>1</td>
<td>Elective (BIOL 39300 pref)</td>
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<td>15-17</td>
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<table>
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<th>Prerequisite</th>
<th>Credit</th>
<th>Spring 4th Year</th>
<th>Prerequisite</th>
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<tbody>
<tr>
<td>3</td>
<td>Cell/Molecular/Develop Selective I</td>
<td></td>
<td>3</td>
<td>Cell/Molecular/Develop Selective II</td>
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<tr>
<td>2-4</td>
<td>Base Lab Requirement</td>
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<td>Science Core Option</td>
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<td>Science Core Option</td>
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<tr>
<td>1-3</td>
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<tr>
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<tr>
<td>12-16</td>
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<td></td>
<td>15</td>
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<td></td>
</tr>
</tbody>
</table>

## Science Core Curriculum Options

(One course needed for each requirement unless otherwise noted)

### Options recommended for first- and second-year students
- Freshman Composition\(^UC\)
- General Education\(^UC\) (3 courses needed)
- Foreign Language and Culture\(^UC\) (3 courses needed)
- Multidisciplinary\(^UC\) (BIOL 12100)

### Options recommended for third- and fourth-year students
- Technical Writing and Presentation\(^UC\) (COM 217 recommended)
- Statistics (STAT 50300)
- Computing (CS 17700 or CS 18000 also meet Teambuilding)
- Great Issues

\(^UC\) Select courses may also satisfy a University Core Curriculum requirement; see the University Core Requirement course list for approved courses. Students must have 32 credits at the 30000 level or above taken at Purdue.
**CELL, MOLECULAR AND DEVELOPMENTAL BIOLOGY (CMDB)**

**Fall 2022**

**Graduation Requirements:**
- A minimum 2.0 average in all biology courses required for this major
- At least one 3-credit 500-level Biology course is required
- A minimum of 32 credits at or above the 300-level completed at a Purdue campus
- 120 Total Credits

**BIOLOGY CORE:**

1. BIOL 12100 Biology I: Diversity, Ecology and Behavior (2 cr.; fall)
2. BIOL 13100 Biology II: Development, Structure, and Function of Organisms (3 cr.; spring)
3. BIOL 13500 1st Year Biology Lab (2 cr.; both) or
   - BIOL 19500 Year I Bio Lab: Diet, Disease & the Immune System (2 cr.; spring) or
   - BIOL 19500 Year I Bio Lab: Disease Ecology (2 cr.; alternate fall) or
   - BIOL 19500 Year I Bio Lab: Phages to Folds (2 cr.; fall) or
4. BIOL 22600 Biotechnology Lab (2 cr.; fall)
5. BIOL 23100 Biology III: Cell Structure and Function (3 cr.; fall)
6. BIOL 23200 Laboratory in Biology III: Cell Structure and Function (2 cr.; fall)
7. BIOL 24100 Biology IV: Genetics and Molecular Biology (3 cr.; spring)
8. BIOL 24200 Laboratory in Genetics and Molecular Biology (2 cr.; spring)
9. **Intermediate Biology Selective:** Choose one of these eight options:
   - **(Cell, Molecular, and Developmental Biology majors must take BIOL 36700, 41500 or 42000 for this requirement.)**
   - A. BIOL 32800 Principles of Physiology (4 cr.; spring)
   - B. BIOL 36700 Principles of Development (2 cr.; spring)
   - C. BIOL 39500 Macromolecules (2 cr.; fall)
   - D. BIOL 41500 Intro. to Molecular Biology (3 cr.; spring)
   - E. BIOL 41600 Viruses & Viral Diseases (3 cr.; spring)
   - F. BIOL 42000 Eukaryotic Cell Biology (3 cr.; fall)
   - G. BIOL 43600 Neurobiology (3 cr.; fall)
   - H. BIOL 43800 General Microbiology (3 cr.; fall)
10. **CMDB Selectives I:** (choose two)
    - A. BIOL 41500 Intro. to Molecular Biology (3 cr.; spring)
    - B. BIOL 41500* Intro. to Molecular Biology (3 cr.; spring)
    - C. BIOL 42000 Eukaryotic Cell Biology (3 cr.; fall)
    - D. BIOL 48100* Eukaryotic Genetics (3 cr.; spring)
11. **Chemistry Selective:** One of these three courses:
    - A. BCHM 56100 General Biochemistry I (3 cr.; fall)
    - B. CHM 33900* Biochemistry: A Molecular Approach (3 cr.; spring)
    - C. CHM 39000* Biochemistry (3 cr.; fall)
12. CHM 3900* Biochemistry Laboratory (1 cr.; spring)
13. **Lab Requirement:** Must meet Base Lab requirement as described on the back of this page

**CMDB Selective II:**

- A. BIOL 51600 Molecular Biology of Cancer (3 cr.; spring)
- B. BIOL 55001* Eukaryotic Molecular Biology (3 cr.; spring)
- C. BIOL 59500 CRISPR Mechanisms & Applications (3 cr.; spring)
- D. BIOL 59500 Cellular Biology of Plants (3 cr.; alt fall)
- E. BIOL 59500* Pathways in Human Health & Disease (3 cr.; spring)
- F. BIOL 59500* Genetics and –Omic of Host-Microbe Interaction (3 cr.; alt spring)
- G. BIOL 59500* Theory of Molecular Methods (3 cr.; spring)

**Biology Selectives:** Three credits of the following:

- BIOL 39500 Macromolecules (2 cr.; fall)
- BIOL 39500* Experimental Design & Quantitative Analysis (3 cr.; summer)
- BIOL 41600 Viruses and Viral Diseases (3 cr.; spring)
- BIOL 43600 Neurobiology (3 cr.; fall)
- BIOL 43800 General Microbiology (3 cr.; fall)
- BIOL 43900* Microbiology Lab (2 cr.; fall)
- BIOL 44600 Molecular Biology of Pathogens (3 cr.; alt spring)
- BIOL 47800* Intro to Bioinformatics (3 cr.; fall)
- BIOL 48100* Eukaryotic Genetics (3 cr.; spring)
- BIOL 48300 Environmental & Conservation Biology (3 cr.; alt spring)
- BIOL 49500* Biodiversity & Museum Research (3 cr.; fall)
- BIOL 49500* Topics in Endocrinology & Cancer (2 cr.; spring)
- BIOL 49500 The RNA World, CRISPR & Coronavirus (3 cr; spring)
- BIOL 51600* Molecular Biology of Cancer (3 cr.; spring)
- BIOL 51600* Experimental Design & Quantitative Analysis (3 cr.; spring)
- BIOL 51700 Molecular Biology: Proteins (2 cr.; alt spring)
- BIOL 52900 Bacterial Physiology (3 cr.; spring)
- BIOL 53300 Medical Microbiology (3 cr.; fall)
- BIOL 53601 Biological & Structural Aspects of Drug Design & Action (3 cr; spr)
- BIOL 53700 Immunology (3 cr.; fall)
- BIOL 53800 Molec, Cellular & Develop Neuro (3 cr.; spring)
- BIOL 54100 Molecular Genetics of Bacteria (3 cr.; fall)
- BIOL 54900 Microbial Ecology (2 cr.; alt spring)
- BIOL 55001* Eukaryotic Molecular Biology (3 cr.; spring)
- BIOL 56200* Neural Systems (3 cr.; spring)
- BIOL 56310 Protein Bioinformatics (2 cr.; alt spring)
- BIOL 58000 Evolution (3 cr.; spring)
- BIOL 58210* Ecological Statistics (3 cr.; fall)
- BIOL 58705 Animal Communication (3 cr.; alt fall)
- BIOL 59100* Field Ecology (4 cr.; alt fall)
- BIOL 59200 Evolution of Behavior (3 cr.; spring)
- BIOL 59500* Building the Tree of Life (3 cr.; spring)
- BIOL 59500* Cellular Biology of Plants (3 cr.; fall)
- BIOL 59500* CRISPR Mechanisms & Applications (3 cr.; spring)
- BIOL 59500* Cellular Biology of Plants (3 cr.; fall)
- BIOL 59500* Disease Ecology (3 cr.; spring)
- BIOL 59500* Ecology (3 cr.; fall)
- BIOL 59500* Intro. to X-Ray Crystallography (3 cr.; spring)
- BIOL 59500* Methods & Measurmt in Physical Biochem (3 cr.; fall)
- BIOL 59500* Genetics and –Omic of Host-Microbe Int. (3 cr.; alt spring)
- BIOL 59500* Neural Mechanisms in Health & Disease (3 cr.; alt spring)
- BIOL 59500* Neurobiology of Learning & Memory (3 cr.; alt fall)
- BIOL 59500* Pathways in Human Health & Disease (3 cr.; spring)
- BIOL 59500* Theory of Molecular Methods (3 cr.; fall)
- BCHM 43400 Medical Topics in Biochemistry (3 cr.; spring)
- BCHM 52100* Comparative Genomics (3 cr.; spring)

Footnotes and other requirements are on the next two pages
Base Laboratory Requirement (BLR) for all Biology Majors

1. Students must complete one of the “Required” courses in the chart below. Undergraduate research cannot be used to meet this requirement.

2. Students must also complete Objectives A and B as listed in the chart below with courses or research or a combination of the two.

3. Descriptions of Objectives A and B (not all tasks must be met to satisfy an objective):
   a. **Objective A** – Demonstrate the ability to plan and design hypothesis-driven experiments, simulations or discovery/observational experiments
      i. Conduct an appropriate literature review for a specific scientific topic.
      ii. Generate an applicable hypothesis (-es) for your research project
      iii. Identify techniques to be used in your project, with justification of those techniques.
      iv. Write a formal research proposal.
      v. Write a detailed outline of experiments
   b. **Objective B** - Develop the ability to appropriately analyze, critically evaluate, and depict data. Demonstrate the ability to effectively communicate scientific information orally and in writing, including synthesizing and evaluating scientific literature and putting experimental results in their appropriate scientific context.
      i. Analyze data
      ii. Use appropriate ways to depict and communicate data (e.g., graphs, movies, images, etc.). Present the research at lab meetings, in a talk, or at a poster session.
      iii. Write a summary (or summaries) of the data.

4. If research is used, the research director will be the one who decides if the research meets Obj A and/or Obj B.

5. If research is used, it must include at least four credits of BIOL 49400 or 49900. BIOL 29400 research does not count toward this requirement.

6. Students who successfully complete a Biology Honors Research Thesis have successfully met Objectives A and B but must still complete a “Required Course.”

7. The “Microbiology” and the “Health & Disease” majors both require BIOL 43900: the “Ecology, Evolution and Environmental Biology” major requires BIOL 59500 Laboratory in Ecology.

### Base Laboratory Requirement Chart

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Required Course</th>
<th>Obj. A</th>
<th>Obj. B</th>
<th>Usually Offered</th>
<th>Format</th>
<th>Pre-Req (PR) or Co-Req (CR) beyond core courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 32800</td>
<td>Principles of Physiology (4cr)</td>
<td>X</td>
<td></td>
<td></td>
<td>Spring</td>
<td></td>
<td>PR=32800</td>
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<tr>
<td>BIOL 39500DIST</td>
<td>Exper Design &amp; Quant Analysis (3cr)</td>
<td></td>
<td>X</td>
<td>X</td>
<td>Summer</td>
<td></td>
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<tr>
<td>BIOL 43900</td>
<td>Microbiology Lab (2cr)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Fall</td>
<td>PR/CR=43800</td>
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<tr>
<td>BIOL 44212</td>
<td>Microscopy &amp; Cell Bio (1cr)</td>
<td>X</td>
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<td>Spring</td>
<td>5-wk module</td>
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<tr>
<td>BIOL 48300</td>
<td>Environmental &amp; Conservation Biology (3cr)</td>
<td>X</td>
<td>X</td>
<td></td>
<td>alt Spring '24</td>
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<tr>
<td>BIOL 49500BMR</td>
<td>Biodiversity &amp; Museum Research (3cr)</td>
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<tr>
<td>BIOL 49500DSB</td>
<td>Data Science for Biologists (3cr)</td>
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<td>X</td>
<td>X</td>
<td>Fall</td>
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<tr>
<td>BIOL 49500</td>
<td>Data Science: Good vs. Bad Data (3cr)</td>
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<td>X</td>
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<tr>
<td>BIOL 49500RAB</td>
<td>Research in Animal Behavior (1cr)</td>
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<td>5-wk module</td>
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<tr>
<td>BIOL 49500TEC</td>
<td>Topics in Endocrinology &amp; Cancer (2cr)</td>
<td></td>
<td>X</td>
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<tr>
<td>BIOL 54200</td>
<td>Neurophysiology (1cr)</td>
<td>X</td>
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<td>5-wk module</td>
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<td>BIOL 58210</td>
<td>Ecological Statistics (3cr)</td>
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<td>PR=STAT 50300</td>
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<tr>
<td>BIOL 59100</td>
<td>Field Ecology (4cr)</td>
<td>X</td>
<td>X</td>
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<td>alt Fall '23</td>
<td>PR=59500EL</td>
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<td>BIOL 59500BTL</td>
<td>Building the Tree of Life: Phylogenetics (3cr)</td>
<td>X</td>
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<td>Spring</td>
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<td>research experience recommended</td>
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<td>BIOL 59500CRYO</td>
<td>CryoEM 3D Reconstruction (3cr)</td>
<td>X</td>
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<td>Fall</td>
<td>PR=PHYS 23300 or 17200</td>
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<td>BIOL 59500N</td>
<td>Data Analysis in Neuroscience (1cr)</td>
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<td>X</td>
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<td>Spring</td>
<td>5-wk module</td>
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<tr>
<td>BIOL 59500EL</td>
<td>Laboratory in Ecology (1cr)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Fall</td>
<td>PR/CR=59500 Ecology</td>
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<tr>
<td>BIOL 59500</td>
<td>Neural Mechanisms in Health &amp; Disease (3cr)</td>
<td>X</td>
<td>X</td>
<td></td>
<td>alt Spring '23</td>
<td>PR=32800 or 43600; CR=56200</td>
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<tr>
<td>BIOL 59500SBL</td>
<td>Structural Biology Lab (1cr)</td>
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<td>X</td>
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<td>Spring</td>
<td>5-wk module</td>
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<tr>
<td>BIOL 59500TMM</td>
<td>Theory of Molecular Methods (3cr)</td>
<td></td>
<td>X</td>
<td>X</td>
<td>alt Spring</td>
<td>molecular biology</td>
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</table>
CHEMISTRY

1. **General Chemistry:**
   CHM 12901 General Chemistry with a Biological Focus (5 cr.; fall)

2. **Organic Chemistry:**
   CHM 25500 Organic Chemistry (3 cr.; both) and CHM 25501 Organic Chemistry Lab (1 cr.; both) and
   CHM 25600 Organic Chemistry (3 cr.; both) and CHM 25601 Organic Chemistry Lab (1 cr.; both)

PHYSICS Selectives:

   One of these two options:
   
   1. PHYS 23300 Physics for Life Sciences I (4 cr.; both) and
      PHYS 23400 Physics for Life Sciences II (4 cr.; both)
   
   2. PHYS 17200 Modern Mechanics (4 cr.; both) and one of the following two choices:
      A. PHYS 27200 Electric and Magnetic Interactions (4 cr.; both)
      B. PHYS 24100 Electricity and Optics (3 cr.; both) and PHYS 25200 Electricity and Optics Laboratory (1 cr.; spring)

OTHER: all University Core, College of Science Core, and Civics Literacy Requirements must be completed.

FREE ELECTIVES

   Approximately 12-24 credits

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1. Course(s) taken for the Intermediate Biology Selective may NOT overlap with requirement #10.
2. Course(s) taken for requirement #10 may NOT overlap with requirement #15.
3. Students who select 12901 for General Chemistry must take CHM 33900 and 33901. Students who end up with Special Case approval for some other Gen Chem courses may choose the other Chem Selective options. All students must take CHM 33901.
4. Course chosen for requirement #14 may NOT overlap with requirement #15.
5. This course may count for a Biology Selective and as the College of Science Multidisciplinary requirement.
6. This course may count for a Biology Selective and as the College of Science Great Issues requirement.
7. This course may count for a Biology Selective and toward the Base Lab Requirement.

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CMDB 6/2022