PURDUE UNIVERSITY

Biology (BIOL)

College of Science

2022-2023

Program Progression Guides

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.

University Degree Requirements		
Minimum 2.0 Cumulative GPA	Minimum 120 Credits that fulfill degree requirements	32 Residency Credits (30000-level and above) at a Purdue University campus
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 Biology
Degree Progression Guide

The Department of Biological Sciences has suggested the following degree progression guide for the 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.

Credit	Fall 1st Year	Prerequisite	Credit	Spring 2nd Year	Prerequisite
2	BIOL 12100		3	BIOL 13100	
5	CHM 12901	ALEKS 85 or Calc Placement	4	CHM 25500-25501	CHM 12901
2	BIOL 13500 or 19500	CHM 12901 co-req	3-5	Calculus II selective	Calculus I (with min grade C-)
3-5	Calculus I selective	ALEKS 75 or 85	3-4	Science Core Option	
3	Science Core Option		3	Science Core Option	
1	Elective (BIOL 11500 pref.)	BIOL 12100 co-req			
16-18			**16-19**		

Credit	Fall 2nd Year	Prerequisite	Credit	Spring 2nd Year	Prerequisite
3	BIOL 23100	BIOL 13100 and co-req CHM 12901	3	BIOL 24100	BIOL 23100
2	BIOL 23200	Co-req BIOL 23100	2	BIOL 24200	
4	CHM 25600-25601	CHM 25500	3	CHM 33900	C- or better in all prior CHM courses
3	Science Core Option		1	CHM 33901	CHM 33900 co-req
3	Science Core Option		2	BIOL 28600	BIOL 12100
			1	Free Elective (BIOL 29300 pref)	
			3	Science Core Option	
15			**15**		

Credit	Fall 3rd Year	Prerequisite	Credit	Spring 3rd Year	Prerequisite
3-4	Intermediate Biology Selective		3-4	Group B Selective	
2-3	Group A Selective		3-4	Science Core Option	
4	PHYS I Selective		4	PHYS II Selective	
3	Science Core Option		1	Elective (BIOL 39300 pref.)	
3	Elective		3	Science Core Option	
15-17			**14-16**		

Credit	Fall 4th Year	Prerequisite	Credit	Spring 4th Year	Prerequisite
2-4	Base Lab Requirement		3	Biology 500 Level Selective	
3	Science Core Option		3	Biology Selective	
1-3	Science Core Option		3	Science Core Option	
3	Elective		4	Elective	
4	Elective		3	Elective	
13-17			**16**		

Science Core Curriculum Options **(one course needed for each requirement unless otherwise noted)**	
Options recommended for first- and second-year students	**Options recommended for third- and fourth-year students**
Freshman Composition[UC]	Technical Writing and Presentation[UC] (COM 217 recommended)
General Education[UC] (3 courses needed)	Statistics (STAT 50300)
Foreign Language and Culture[UC] (3 courses needed)	Computing (CS 17700 or CS 18000 also meet Teambuilding)
Multidisciplinary[UC] (BIOL 12100)	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.

BIOLOGY (BIOL)

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 Minimum*

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**
   ABE 22600 Biotechnology Lab (2 cr.; fall)
4. BIOL 23100 Biology III: Cell Structure and Function (3 cr.; fall)
5. BIOL 23200 Laboratory in Biology III: Cell Structure and Function (2 cr.; fall)
6. BIOL 24100 Biology IV: Genetics and Molecular Biology (3 cr.; spring)
7. BIOL 24200 Laboratory in Genetics and Molecular Biology (2 cr.; spring)
8. BIOL 28600 Intro. to Ecology & Evolution (2 cr.; spring)
9. **Intermediate Biology Selective:** Choose one of these eight options:
   - A. BIOL 32800[1] Principles of Physiology (4 cr.; spring)
   - B. BIOL 36700[2] Principles of Development (2 cr.; spring)
   - C. BIOL 39500[2] Macromolecules (2 cr.; fall)
   - D. BIOL 41500[2] Intro. to Molecular Biology (3 cr.; spring)
   - E. BIOL 41600[2] Viruses & Viral Diseases (3 cr.; spring)
   - F. BIOL 42000[2] Eukaryotic Cell Biology (3 cr.; fall)
   - G. BIOL 43600[2] Neurobiology (3 cr.; fall)
   - H. BIOL 43800[2] General Microbiology (3 cr.; fall)
10. CHM 33901[8] Biochemistry Laboratory (1 cr; spring)
11. **Biology Selectives: Twelve credits** from the following: must choose at least **one** Group A Selective, at least **one** Group B Selective, at least **one** option from the Biology Lab Selective list, and at least **one** 500-level course from the Group A Selectives or Group B Selectives. Overlap (A, B, 500, Lab) is allowed, but 12 credits must still be earned.

Group A Selective:

BIOL 39500[2] Macromolecules (2 cr.; fall)
BIOL 41500[2] Intro. to Molecular Biology (3 cr.; spring)
BIOL 41600[2] Viruses and Viral Diseases (3 cr.; spring)
BIOL 42000[2] Eukaryotic Cell Biology (3 cr.; fall)
BIOL 43600[2] Neurobiology (3 cr.; fall)
BIOL 43800[2] General Microbiology (3 cr.; fall)
BIOL 43900[3] Microbiology Lab (2 cr.; fall)
BIOL 44600 Molecular Biology of Pathogens (3 cr.;alt spring)
BIOL 47800[4] Intro to Bioinformatics (3 cr.; fall)
BIOL 48100 Eukaryotic Genetics (3 cr.; spring)
BIOL 49500 The RNA World, CRISPR & Coronavirus (2 cr.; spring)
BIOL 51100 Intro to X-Ray Crystallography (3 cr.; spring)
BIOL 51600 Molecular Biology of Cancer (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 53800 Molecular, 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[4] Neural Systems (3 cr.; spring)
BIOL 56310 Protein Bioinformatics (2 cr.; alt spring)
BIOL 59500 Cellular Biology of Plants (3 cr.; fall)
BIOL 59500 CRISPR Mechanisms & Applications (3 cr.; spring)
BIOL 59500 Genetics & –Omics of Host-Microbe Interactions (3 cr.; alt spring)
BIOL 59500 Methods & Measurements in Physical Biochem (3 cr.; fall)
BIOL 59500[3] Neural Mechanisms 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 Practical Biocomputing (3 cr.; spring)
BIOL 59500[3] Theory of Molecular Methods (3 cr.; spring)
BCHM 43400 Medical Topics in Biochemistry (3 cr.; spring)
BCHM 56100[5] General Biochemistry I (3 cr.; fall)
BCHM 56200 General Biochemistry II (3 cr.; spring)
CHM 33900[5] Biochemistry: A Molecular Approach (3 cr.; spring)
CHM 43300[5] Introductory Biochemistry (3 cr.; fall)

Group B Selective:

BIOL 32800[1,7] Principles of Physiology (4 cr.; spring)
BIOL 36700[2] Principles of Development (2 cr.; spring)
BIOL 39500[7] Experimental Design & Quantitative Analysis (3 cr.; summer)
BIOL 3xxxx Human Anatomy & Physiology II (4 cr.; spring)
BIOL 48300[6,7] Environmental & Conservation Biol (3 cr.; alt spring)
BIOL 49500[7] Biodiversity & Museum Research (3 cr.; fall)
BIOL 49500[7] Data Science for Biologists (3 cr.; fall)
BIOL 53700 Immunology (3 cr.; fall)
BIOL 58000 Evolution (3 cr.; spring)
BIOL 58210[7] Ecological Statistics (3 cr.; fall)
BIOL 58705 Animal Communication (3 cr.; alt fall)
BIOL 59100[7] Field Ecology (3 cr.; alt fall)
BIOL 59200 Evolution of Behavior (3 cr.; spring)
BIOL 59500[7] Building the Tree of Life: Phylogenetics (3 cr.; spring)
BIOL 59500 Disease Ecology (3 cr.; spring)
BIOL 59500 Ecology (3 cr.; fall)
HORT 30100 Plant Physiology (4 cr.; spring)

Lab Requirement: Must meet Base Lab requirement as described on the back of this page. Only three credits of undergraduate research may count toward the 12-credit requirement. Any course(s) used for the Base Lab Requirement may also count toward the 12 credits.

Other Credits that will count toward the 12 credits of Biology Selectives but not toward the Group A or Group B requirement:

Research (BIOL 49400 or BIOL 49900, max of 3 credits)
BIOL 44100 Senior Seminar in Genetics (1 cr.; fall)
Any BIOL 442xx or 54200 lab module (1-2 cr.; both)
BIOL 59500 Lab in Ecology (1 cr.; fall)
BIOL 49500 Research in Animal Behavior (1 cr.; fall)
BIOL 49500 Topics in Endocrinology & Cancer (2 cr.; spring)
BCHM 52100 Comparative Genomics (3cr; 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

Course	Title	Required Course	Obj. A	Obj. B	Usually Offered	Format	Pre-Req (PR) or Co-Req (CR) *beyond* core courses
BIOL 32800	Principles of Physiology (4cr)	X			Spring		
BIOL 39500DIST	Exper Design & Quant Analysis (3cr)		X	X	Summer		
BIOL 43900	Microbiology Lab (2cr)	X	X	X	Fall		PR/CR=43800
BIOL 44212	Microscopy & Cell Bio (1cr)	X		X	Spring	5-wk module	
BIOL 48300	Environmental & Conservation Biology (3cr)		X	X	alt Spring '24		
BIOL 49500BMR	Biodiversity & Museum Research (3cr)		X	X	Fall		
BIOL 49500DSB	Data Science for Biologists (3cr)	X	X	X	Fall		PR=28600
BIOL 49500	Data Science: Good vs. Bad Data (3cr)		X	X	Fall		
BIOL 49500RAB	Research in Animal Behavior (1cr)	X	X	X	Fall	5-wk module	
BIOL 49500TEC	Topics in Endocrinology & Cancer (2cr)		X	X	Spring		
BIOL 54200	Neurophysiology (1cr)	X		X	Fall	5-wk module	PR=32800 or CR=43600
BIOL 58210	Ecological Statistics (3cr)		X	X	Fall		PR=STAT 50300
BIOL 59100	Field Ecology (4cr)	X	X	X	alt Fall '23		PR=59500EL
BIOL 59500BTL	Building the Tree of Life: Phylogenetics (3cr)	X	X	X	Spring		research experience recommended
BIOL 59500CRYO	CryoEM 3D Reconstruction (3cr)		X	X	Fall		PR=PHYS 23300 or 17200
BIOL 59500BN	Data Analysis in Neuroscience (1cr)			X	Spring	5-wk module	
BIOL 59500EL	Laboratory in Ecology (1cr)	X	X	X	Fall		PR/CR=59500 Ecology
BIOL 59500	Neural Mechanisms in Health & Disease (3cr)		X	X	alt Spring '23		PR=32800 or 43600; CR=56200
BIOL 59500SBL	Structural Biology Lab (1cr)	X		X	Spring	5-wk module	
BIOL 59500TMM	Theory of Molecular Methods (3cr)		X	X	alt Spring		molecular biology

CHEMISTRY

1. **General Chemistry**:

   CHM 12901[8] 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)

3. **Chemistry Selectives:** (must choose one of the following options) [8]

   a. BCHM 56100[5] General Biochemistry I (3 cr.; both) **or**
   b. CHM 33900[5,8] Biochemistry: A Molecular Approach (3 cr.; spring) **or**
   c. CHM 43300[5] Introductory Biochemistry (3 cr.; fall)

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) or
   B. PHYS 24100 Electricity and Optics (3 cr.; both) and PHYS 25200 Electricity and Optics Laboratory (1 cr.; spring)

COLLEGE OF SCIENCE CORE

Composition and Presentation; Teambuilding and Collaboration; Language and Culture; Great Issues; General Education; Multidisciplinary Experience; Mathematics; Statistics; Computing

OTHER: all University Core and Civics Literacy Requirements must also be completed.

FREE ELECTIVES Approximately 14-26 credits

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[1] This course may count for the Intermediate Biology Selective or as a Group B course (not both). It may also count as the College of Science Teambuilding & Collaboration requirement.

[2] Credits chosen for the Intermediate Requirement may satisfy #9 OR count as part of the 12 credit requirement (#10), but not both.

[3] This course may count for a Group A course and as the Base Lab Requirement. You must still complete 12 total credits of biology selectives.

[4] This course may count for a Group A course and as the College of Science Multidisciplinary requirement.

[5] BCHM 56100 or CHM 33900 or CHM 43300 may count as a Chemistry Selective or as a Biology Selective, but not both.

[6] This course may count for the Group B course and as the College of Science Great Issues requirement.

[7] This course may count for a Group B course and toward the Base Lab Requirement, but 12 total credits of Biology Selectives must still be earned.

[8] Students who take CHM 12901 for General Chemistry must take CHM 33900 **and** 33901 for the Chemistry Selective. 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.
