

# BIOLOGY B.S. WITH A CONCENTRATION IN BIOMEDICAL SCIENCE

## Program Learning Outcomes

VU Biology graduates should be able to:

1. **Demonstrate** proficiency in *general biology concepts and theories*, as well as in self-selected biology sub-disciplines in order to succeed in careers and graduate programs.
2. **Illustrate** sufficient proficiency in *calculus, general chemistry, organic chemistry, and physics* in order to understand biological concepts involving these disciplines.
3. **Operate** basic *scientific instruments* necessary for biological investigations such as microscopes, centrifuges, spectrophotometers, electrophoresis equipment and pH meters thus demonstrating competency in *basic laboratory skills*, cell culture, and field techniques.
4. **Design** and conduct experiments –both individually and in small groups– using appropriate strategies such as: *collect, organize, analyze, interpret, and present quantitative & qualitative data and incorporate* them into the broader context of biological knowledge.
5. **Analyze and evaluate** various types of *scientific information* including primary research articles, mass media sources and world-wide web information.
6. **Disseminate** and *present biological data* with theoretical and historical perspectives –both in oral and written formats– to a diverse audience.
7. **Use critical and creative thinking to solve problems** by compiling and analyzing scientific information from library, electronic, and experimental sources. Effectively apply current technology and scientific methodologies for problem solving.
8. **Articulate** historical, current, and theoretical issues relating to biology and society within a Christ-centered worldview that allows for *evaluation of the relationship of scientific theories with ethical and religious perspectives*, particularly those common to Pentecostal Christians.

## Requirements

Code	Title	Units
	Core Curriculum Requirements ( <a href="https://catalog.vanguard.edu/interdisciplinary-offerings/core-curriculum/">https://catalog.vanguard.edu/interdisciplinary-offerings/core-curriculum/</a> ) <sup>1</sup>	43
	Biology Major Core Requirements	52
	Concentration in Biomedical Science Requirements (p. 1)	29-30
	General Electives	0
	<b>Total Units</b>	<b>124-125</b>

## Biology Major Requirements

Code	Title	Units
<b>Lower Division:</b>		
BIOL-111 & 111L	Principles of Cell and Molecular Biology and Principles of Biology Lab, Principles of Cell/ Molecular Biology Lab	4
BIOL-112 & 112L	Principles of Organismal Biology and Principles of Organismal Biology Lab	4
BIOL-220 & 220L	Cell Biology and Cell Biology Lab	4
CHEM-120 & 120L	General Chemistry I and General Chemistry I Lab	4
CHEM-121 & 121L	General Chemistry II and General Chemistry II Lab	4
MATH-180C	Calculus I	4
PSCI-223C & 223CL	Mechanics of Solids and Fluids and Mechanics of Solids and Fluids Lab	4
or PSCI-130C & 130CL	General Physics I and General Physics I Lab	
PSCI-225 & 225L	Electricity and Magnetism and Electricity and Magnetism Lab	4
or PSCI-131 & 131L	General Physics II and General Physics II Lab	
	Lower Division Biology Elective (Lecture/Lab)	4
<b>Upper Division:</b>		
BIOL-309 & 309L	Microbiology and Microbiology Laboratory	4
BIOL-311 & 311L	Genetics and Genetics Laboratory	4
BIOL-485	Undergrad Biological Research	2
or BIOL-488	Biology Senior Project	
or BIOL-450	UG Research or Internship Program	
or BIOL-406	Research Methods in Neurobiology	
BIOL-499C	Capstone Seminar in Biology	2
	Upper Division Biology Elective (Lecture/Lab)	4
	<b>Total Units</b>	<b>52</b>

## Concentration in Biomedical Science

Code	Title	Units
BIOL-302 & 302L	Comparative Vertebrate Anatomy and Comp Vertebrate Anatomy Lab	4
BIOL-304 & 304L	Human Physiology and Human Physiology Lab	4
CHEM-304 & 304L	Organic Chemistry I and Organic Chemistry Techniques I	4
CHEM-305 & 305L	Organic Chemistry II and Organic Chemistry Technqs II	4
CHEM-430 & 430L	Biochemistry and Experimental Tech/Biochemistry	4
MATH-270C	Health Professions Statistical Methods	3
PSYC-103C	Introduction to Psychology <sup>2</sup>	3



Select an upper division (300-400 level) lecture/laboratory courses from BIOL/BIOT<sup>3</sup> 3-4

**Total Units 29-30**

1

Number of units required from the Core Curriculum not included in the major requirements below.

2

PSYC-103C Introduction to Psychology is both a program requirement and fulfills a CORE Curriculum requirement.

3

In consultation with your academic advisor, select one lecture/lab combination that best aligns with your career goals. Additional course selections in Kinesiology or Psychology may be approved on a case-by-case basis.

## Four Year Plan

**Disclaimer:** This *sample Four Year Plan* is provided as a guide for the recommended sequencing of courses. Vanguard University requires that students complete a minimum of 120 units of required course work as outlined on the Requirements tab in order to receive a bachelor's degree. It is the student's responsibility to confirm with the department the course rotation before enrolling in courses. Questions, contact the Department of Biology.

**Study Abroad Participation:** Students interested in participating in the university's Study Abroad programs are encouraged to reach out to the Global Education and Outreach Office (studyabroad@vanguard.edu) for more information and collaboration in their academic course planning. Students using Education and Training Benefits through the U.S. Department of Veteran Affairs are encouraged to also reach out to the School Certifying Official (veteranscertifyingofficial@vanguard.edu) for more information regarding how benefits can be applied.

Course	Title	Units
<b>Year 1 Term 1</b>		
CORE-100C	Cornerstone	1
BIOL-111	Principles of Cell and Molecular Biology	3
BIOL-111L	Principles of Biology Lab, Principles of Cell/Molecular Biology Lab	1
CHEM-120	General Chemistry I	3
CHEM-120L	General Chemistry I Lab	1
NT-101C	New Testament Survey	3
ENGL-120C	Persuasive Writing	3
<b>Units</b>		<b>15</b>
<b>Year 1 Term 2</b>		
BIOL-112	Principles of Organismal Biology	3
BIOL-112L	Principles of Organismal Biology Lab	1
CHEM-121	General Chemistry II	3
CHEM-121L	General Chemistry II Lab	1
PSYC-103C	Introduction to Psychology	3

MATH-180C	Calculus 1	4
<b>Units</b>		<b>15</b>

### Year 2 Term 1

BIOL-220	Cell Biology	3
BIOL-220L	Cell Biology Lab	1
CHEM-304	Organic Chemistry I	3
CHEM-304L	Organic Chemistry Techniques I	1
ENGL-220C	Researched Writing	3
THEO-PLHD	Theology Core Requirement	3
KINE-148C	Lifetime Fitness and Wellness Lecture	3

**Units 17**

### Year 2 Term 2

CHEM-305	Organic Chemistry II	3
CHEM-305L	Organic Chemistry Technqs II	1
OT-201C	Old Testament Survey	3
FINA-PLCR	Fine Arts Core Curriculum Requirement	3
BIOL-311	Genetics	3
BIOL-311L	Genetics Laboratory	1
BIOL-STATS	Statistics Option	3

**Units 17**

### Year 3 Term 1

BIOL-302	Comparative Vertebrate Anatomy	3
BIOL-302L	Comp Vertebrate Anatomy Lab	1
PSCI-PLGP1	Physics 1 Requirement	4
BIOL-309	Microbiology	3
BIOL-309L	Microbiology Laboratory	1
COMM-201C	Speech Composition and Presentation	3

**Units 15**

### Year 3 Term 2

PSCI-PLGP2	Physics 2 Requirement	4
BIOL-304	Human Physiology	3
BIOL-304L	Human Physiology Lab	1
BIOL-PLHD4	Biology Elective	4
BIOL-485	Undergrad Biological Research	1-4
HIST-PLCR1	History Core Req (US Hist Or Democracy)	3

**Units 16-19**

### Year 4 Term 1

CHEM-430	Biochemistry	3
CHEM-430L	Experimental Tech/Biochemistry	1
HIST-PLCR2	History Core Requirement (World Civ)	3
THEO-300C	Developing a Christian World View	3
BIOL-PLHD4	Biology Elective	4
SOC-PLCR	Social Science Core Curriculum Reqm't	3

**Units 17**

### Year 4 Term 2

BIOL-499C	Capstone Seminar in Biology	2
CHIS-400C	Christian Heritage	3
ENGL-230C	Literature and the Human Experience	3

BIOL-PLHD4	Biology Elective	4
<b>Units</b>		<b>12</b>
<b>Total Units</b>		<b>124-127</b>

**Notes:**

- Year 1, Term 1: Must pass the respective Chemistry and/or Math placement exam(s).
- Year 1, Term 2: PSYC-103C Introduction to Psychology is a Social Science requirement for this major.

