

# BIOLOGY B.S. WITH A CONCENTRATION IN NEUROBIOLOGY

## Program Learning Outcomes

VU Biology graduates should be able to:

- 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.
- Illustrate** sufficient proficiency in *calculus, general chemistry, organic chemistry, and physics* in order to understand biological concepts involving these disciplines.
- 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.
- 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.
- Analyze and evaluate** various types of *scientific information* including primary research articles, mass media sources and world-wide web information.
- Disseminate** and *present biological data* with theoretical and historical perspectives –both in oral and written formats– to a diverse audience.
- 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.
- 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	53
	Concentration in Neurobiology Requirements (p. 1)	26
	General Electives	0
	<b>Total Units</b>	<b>122</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
MATH-270C or MATH-265C	Health Professions Statistical Methods Intro to Statistical Methods	3
PSCI-223C & 223CL or PSCI-130 & 130CL	Mechanics of Solids and Fluids and Mechanics of Solids and Fluids Lab Introduction to Physics I and General Physics I Lab	4
PSCI-225 & 225L or PSCI-131 & 131L	Electricity and Magnetism and Electricity and Magnetism Lab General Physics II and General Physics II Lab	4
<b>Upper Division:</b>		
BIOL-309 & 309L	Microbiology and Microbiology Laboratory	4
BIOL-311 & 311L	Genetics and Genetics Laboratory	4
BIOL-499C	Capstone Seminar in Biology	2
CHEM-304 & 304L	Organic Chemistry I and Organic Chemistry Techniques I	4
	<b>Total Units</b>	<b>49</b>

## Concentration in Neurobiology

Code	Title	Units
BIOL-353	Neuropharmacology	3
BIOL-365	Neurobiology of Learning and Memory	3
BIOL-406	Research Methods in Neurobiology	3
BIOL-432 & 432L	Neuroscience and Neuroscience Lab	4
BIOL-440 & 440L	Molecular Biology and Techniques in Molecular Biology	4
PSYC-103C	Introduction to Psychology <sup>2</sup>	3
	Select six units from the following courses (lecture/lab must be taken concurrently): <sup>3</sup>	6
BIOL-204C & 204CL	Human Anatomy and Human Anatomy Laboratory	
BIOL-302 & 302L	Comparative Vertebrate Anatomy and Comp Vertebrate Anatomy Lab	



BIOL-304 & 304L	Human Physiology and Human Physiology Lab
BIOL-335	Biology of Cancer
BIOT-403	Adv. Research Methods in Biotechnology
BIOT-405 & BIOL-405L	Bioinformatics and Bioinformatics Laboratory
BIOL-451 & 451L	Immunology and Immunology Lab
CHEM-305 & 305L	Organic Chemistry II and Organic Chemistry Technqs II
CHEM-430 & 430L	Biochemistry and Experimental Tech/Biochemistry

**Total Units** **26**

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, Biology, 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 of Arts, Bachelor of Music, Bachelor of Science, or Bachelor of Science in Nursing degree. It is the student's responsibility to confirm with the department the course rotation before enrolling in courses. If applicable, please note the footnotes at the bottom of the page for additional information related to courses listed in a particular year and term. 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 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
ENGL-120C	Persuasive Writing	3

NT-101C	New Testament Survey	3
CHEM-120	General Chemistry I	3
CHEM-120L	General Chemistry I Lab	1

**Units** **15**

### Year 1 Term 2

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 I	4

**Units** **15**

### Year 2 Term 1

BIOL-220	Cell Biology	3
BIOL-220L	Cell Biology Lab	1
ENGL-220C	Researched Writing	3
OT-201C	Old Testament Survey	3
KINE-148C	Lifetime Fitness and Wellness Lecture	3
CHEM-304	Organic Chemistry I	3
CHEM-304L	Organic Chemistry Techniques I	1

**Units** **17**

### Year 2 Term 2

BIOL-311	Genetics	3
BIOL-311L	Genetics Laboratory	1
THEO-PLHD	Theology Core Requirement	3
HIST-PLCR1	History Core Req (US Hist Or Democracy)	3
BIOL-PLHD4	Biology Elective	4
BIOL-STATS	Statistics Option	3

**Units** **17**

### Year 3 Term 1

PSCI-PLGP1	Physics 1 Requirement	4
COMM-201C	Speech Composition and Presentation	3
BIOL-365	Neurobiology of Learning and Memory	3
FINA-PLCR	Fine Arts Core Curriculum Requirement	3
BIOL-309	Microbiology	3
BIOL-309L	Microbiology Laboratory	1

**Units** **17**

### Year 3 Term 2

BIOL-PLHD4	Biology Elective	4
PSCI-PLGP2	Physics 2 Requirement	4
HIST-PLCR2	History Core Requirement (World Civ)	3
BIOL-406	Research Methods in Neurobiology	3

**Units** **14**

### Year 4 Term 1

THEO-300C	Developing a Christian World View	3
BIOL-PLHD4	Biology Elective	4
BIOL-404	Neuropharmacology	3
BIOL-440	Molecular Biology	3

BIOL-440L	Techniques in Molecular Biology	1
<b>Units</b>		<b>14</b>
<b>Year 4 Term 2</b>		
CHIS-400C	Christian Heritage	3
ENGL-230C	Literature and the Human Experience	3
BIOL-432	Neuroscience	3
BIOL-432L	Neuroscience Lab	1
SOC-PLCR	Social Science Core Curriculum Reqmt	3
BIOL-499C	Capstone Seminar in Biology	2
<b>Units</b>		<b>15</b>
<b>Total Units</b>		<b>124</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 required Social Science for this major.

