

# ByDesign Biology

*The Scientific Study of Life*

**New!**  
Coming to Your Classroom  
**FALL 2020**

*Humans are as much a  
part of nature as every other  
creature, and we have a  
specific role to play as part  
of God's Creation.*



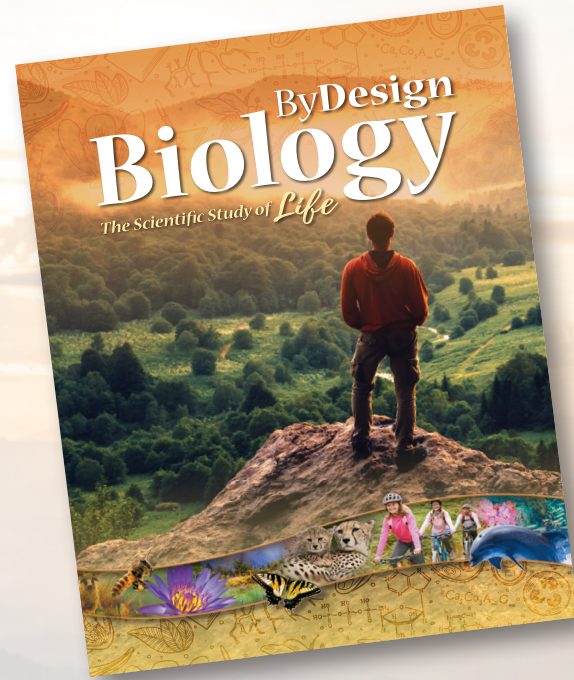


# ByDesign Biology

The Scientific Study of *Life*

Life is recognized on the basis of its characteristics, which include cellular structure, metabolism, reproduction, development, homeostasis, genetic material, and adaptability. Our worldview strongly influences how we see life, the questions we ask about it, and the theories we will consider to explain it.

This new *ByDesign* Biology program, considers two popular contrasting worldviews—materialistic Darwinism, which claims that life originated without divine intervention, and biblical theism, which is the belief in the existence of God. Like all worldviews, the Darwinian and biblical worldviews provide a framework for understanding reality—and particularly biology. This new program explores both worldviews while adhering to the principles, beliefs, and high standards of the Seventh-day Adventist (SDA) educational system.



## Student Edition

The *ByDesign* Biology curriculum is designed to serve the SDA family and is grounded in the foundations of the faith beliefs of the SDA church, making it easy for high school biology teachers to present content while maintaining accordance with SDA worldviews. Parents and families who have consciously chosen a faith-based education for their child(ren) can feel confident in the *ByDesign* Biology curriculum.

## Additional Resources

The *ByDesign* Biology curriculum offers additional resources to assist with program implementation. The in-depth *Teacher Edition* features reduced *Student Edition* pages and includes answer keys and curricular connections to other subjects, such as social studies.

The teacher lab resources also provide additional information to adapt experiments, guide students through potential areas of difficulty, and answer student questions.

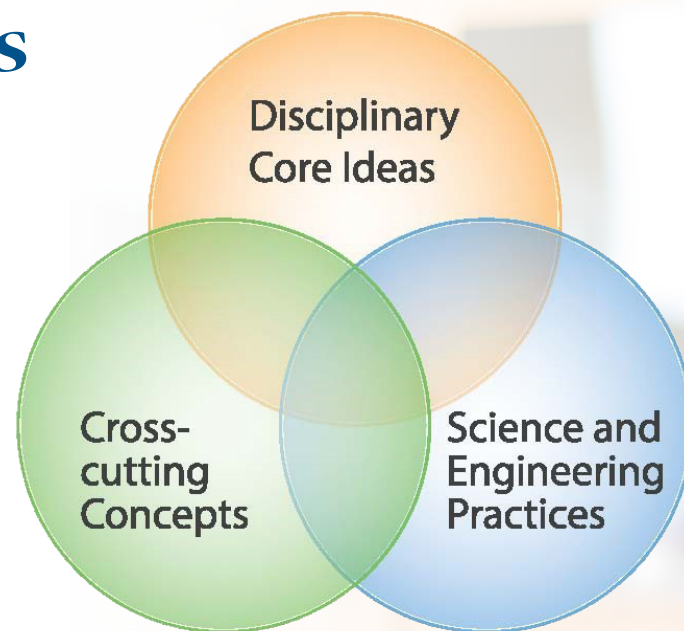
***ByDesign* Biology** provides a commitment to excellence and expands what it means to receive a well-rounded education within our faith-based community.





# Educational Standards

This first edition of **ByDesign Biology** aligns with the SDA high school curriculum standards as well as the Next Generation Science Standards (NGSS). These standards acknowledge that inquiry is central to science learning. The NGSS recommend that science education be built around three dimensions of learning: science and engineering practices, crosscutting concepts, and disciplinary core ideas.



*Three Dimensions of Learning*

The NGSS encourage an explicitly materialistic approach to the sciences, particularly biology. Christians approach nature from a different perspective, one that is either ignored or specifically opposed in most current texts; thus, Christian schools have a need for more balanced textbooks that examine a variety of understandings of nature, including the biblical perspective.



Click here to view

**Program Correlation**  
to NAD Education and NGSS standards

# ByDesign Biology

*The Scientific Study of Life*

Science, and particularly biology, is not about knowing everything; it is a process for discovering something about reality, and that something is amazing. Science is a systematic method of acquiring knowledge and understanding the natural world by collecting and analyzing empirical data, followed by interpretation.



## Scripture Spotlights

show students the connections between unit topics and the Word of God in the Bible, and explicit biblical connections (e.g., the Great Flood as an example of a population bottleneck) also help students use their faith to understand what they learn.



# Curriculum Design

The *ByDesign* Biology program materials feature a new interior design and layout that actively engages all students in the study of science and weaves together a faith-based curriculum. The layout is teacher-friendly and includes suggestions and materials for assessment, differentiation of instruction, and incorporation of technology.

This customized Christian based program includes 27 chapters that offer teachers the flexibility to select the chapters they plan to teach within an eBook. The program provides all the lab resources you will need for you and your students.

# Component Overview

## Student Edition

Available as a hybrid Student Edition (print and eBook with 6-year license)  
Case bound (4-color cover and 4 color interior) with an estimated 744 pages.

## Teacher Edition

Available as an eBook with an estimated 932 pages.  
Student Lab Resources (digital) with an estimated 322 pages.  
Teacher Lab Resources (digital) with an estimated 416 pages.

### 11-1 Mendelian Genetics

Gregor Mendel (Figure 11-1), a German Augustinian friar, is the father of modern genetics. His great insight was that hereditary units, which we call genes, are passed unchanged from parents to offspring. This occurs in patterns that can be described mathematically. Genes inherited from parents influence everything from the color of a dog's fur to the sweetness of grapes. Once Mendel's discovery was recognized, genetics became a tool for understanding how inheritance works and for applying that knowledge to useful tasks like breeding better crops and understanding inherited diseases.

44 The value and utility of any experiment are determined by the fitness of the material to the purpose for which it is used, and thus in the case before us it cannot be immaterial what plants are subjected to experiment and in what manner such experiment is conducted.<sup>94</sup>

—Gregor Mendel

**EXPAND YOUR KNOWLEDGE**

**Experimental Organisms**

Why did Mendel choose peas? An interesting mix of practical, ethical, and philosophical considerations goes into choosing a model organism for use in experiments. Philosophically, we believe that humans are not biologically different from other organisms. Christians are this because in the Bible, God formed all animals, including humans, from the ground and gave them the "breath of life" (compare Genesis 2:7 and 2:9 as well as 6:17 and 7:15). He also created plants from the ground (Genesis 1:11–13). Because all organisms were created from the same material by the same Creator, Christians may expect at least some degree of similarity between the biology of diverse organisms.

Ethically, Christians do not cause avoidable suffering in other organisms; however, the Bible does differentiate between the value of humans and other organisms (see Matthew 10:31 and Luke 12:7, among others). Plants, bacteria, or fungi make excellent model organisms that, to the best of our knowledge, do not suffer in any way when used in experiments. The use of organisms capable of suffering should be kept to a minimum, and if used, the organisms must be cared for properly. It is only under the most necessary circumstances and within carefully defined ethical boundaries that we use humans as experimental subjects.

Review the reasons Mendel chose peas to study genetics on the next page. Other organisms that are commonly used in genetic studies include fruit flies, yeast, and *Arabidopsis thaliana*, a small plant. If you were going to study genetics, what question would you like to answer? Other than organisms already commonly used, can you think of a good choice for your specific investigation?

**Genes, Genotypes, and Phenotypes**

The word *gene* comes from the German word *gen*, which is derived from a Greek word, *genna*, meaning "tribe" or "kind." Genes are the basic units of heredity that are passed from parents to offspring. The genetic makeup of an organism is its **genotype**. Each gene can have alternative forms, called **alleles**. Specific alleles of genes influence the physical makeup of the organism, called its **phenotype**. Phenotypic traits are what we observe as a result of the specific gene alleles present in an organism's genotype. In short, genes are encoded information, while the phenotype is the physical product that results from that information. Different genetic information results in phenotypically different organisms.

**Mendel's Peas**

Mendel made an excellent choice of study organism for his genetic investigation—peas. He was in charge of a garden in his monastery and had access to true-breeding pea plants, meaning varieties that consistently produced offspring exhibiting the same traits. These true-breeding traits include seed texture, seed color, seed coat color, pod shape, pod color, flower position, and stem length (Figure 11-2). Other factors important to Mendel were the ease of growing peas, their short lifespan, their manageable size, and the fertility of offspring when different strains were crossed.

Traits Mendel Studied						
Seed texture	Seed color	Seed coat color	Pod shape	Pod color	Flower position	Stem length
Smooth	Yellow	Gray	Smooth	Green	Axial	Tall
Wrinkled	Green	White	Constricted	Yellow	Terminal	Short

Peas were also an excellent choice because their flower anatomy allows easy control of reproduction. Pea flowers enclose the male and female organs within a petal structure called a keel. This usually ensures self-pollination; the flower only makes seeds (peas) from its own genetic material. However, it is easy to open the keel, remove the anther (male part) of a pea flower, and pollinate the stigma (part of the female carpel) using pollen from another pea plant. Once the petals forming the keel close back around the carpel of the flower, another pea plant will not be able to accidentally pollinate it (Figure 11-3).

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258 Chapter 11 Mendelian and Population Genetics

11-1 Mendelian Genetics 259

*ByDesign* Biology presents the two contrasting worldviews of Darwinism and biblical creationism, allowing students to learn the history and merits of each approach to the understanding of life on Earth. Included are concepts to help deal with philosophical issues that arise when you study faith and science together. The content for student and teacher provides a sound basis for what we believe, and why, regarding origins.

### Chapter 11 Mendelian and Population Genetics

**Introduce the Chapter**

Point out the zebra and then have students consider the questions in the caption on this page. Encourage students to share their ideas. Students may share that the young zebra resembles its mother, but their stripes are different. They may add that they look more like the members of their family because they got their traits from their parents. This would also explain why the young zebra looks like its mother. Tell students that they will learn more about how traits are passed from parent to offspring in the chapter.

**Activate Prior Knowledge**

In prior years, students have been introduced to genetics and DNA. In Chapter 6 of this book, they learned more about the molecular make-up of macromolecules, including DNA. In Chapter 18, students learned about chromosomes, the cellular structures that contain regions of DNA called genes.

**Essential Questions**


Students will be able to answer these essential questions by the end of the chapter.

- How did Mendel's experiments provide evidence of how traits are inherited?
- How can models like Punnett squares and the Hardy-Weinberg equation, along with concepts of probability, be used to predict and explain genetic outcomes in individuals and populations?
- What are Mendel's two laws of inheritance, and how do they apply to the inheritance of traits?

258 Chapter 11

### Chapter Topics

- 11-1 Mendelian Genetics
- 11-2 Punnett Squares and Probability
- 11-3 Heredity and New Applications
- 11-4 Population Genetics



259 Chapter 11

### WHY LEARN THIS

#### 11-1 Mendelian Genetics

**Objectives**

- Describe Mendel's genetic experiments with pea plants.
- Describe Mendel's two kinds of genetic crosses.
- Distinguish the genotype from the phenotype.
- Compare and contrast dominant and recessive traits.
- Distinguish alleles and genes.

**Explain**

**Teaching Tip**

Passing of traits from parent to offspring, family resemblances, and genetic disorders are sensitive topics that will be covered in this chapter. Be mindful of students who are not living with biological family members. When discussing genetic disorders, be careful not to describe individuals as abnormal.

**Misconception Alert**

Students might have the misconception that Mendel had an understanding of genes and chromosomes. It is important for them to understand that Mendel's work preceded the discovery of genes, making his insights that much more remarkable. Students might also have the misconception that all or some traits are entirely genetic. Explain that even identical twins (who have the same DNA) have differences due to the influence of the environment.

**EXPAND YOUR KNOWLEDGE**

**Experimental Organisms**

Mendel's choice of peas was fortuitous. He had access to peas and garden space. Peas reproduce rapidly, so results can be observed quickly. Peas have traits with easily visible and distinct variations. However, Mendel did not know that each of the traits he studied was controlled by a single gene. He also had no way of knowing that the traits he studied were inherited independently of the others.

Based on the information in the feature, have students discuss how genetics could be ethically studied with organisms. Have them make and support a claim about a good organism to use for a specific investigation. Students might support their claim by identifying characteristics such as short generation time, identifiable traits, and ethical considerations.

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258 Chapter 11 Mendelian and Population Genetics

11-1 Mendelian Genetics 259

Student Edition, Chapter 11

Teacher Edition, Chapter 11



Click here to view  
Sample Chapter



ByDesign Biology is an inquiry-based biology program that is creative, engaging, and interactive, challenging students' natural curiosity. The underlying structure of each unit is designed with the principles of inquiry in mind, and the labs accompanying each unit allow students to put their learning into action.

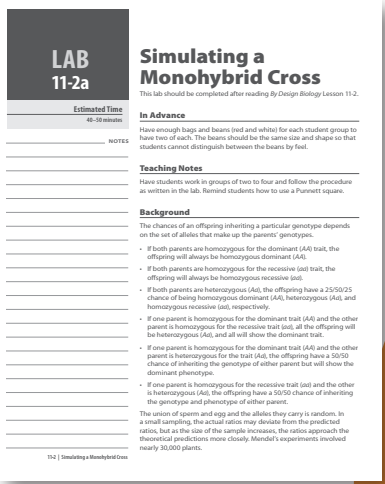
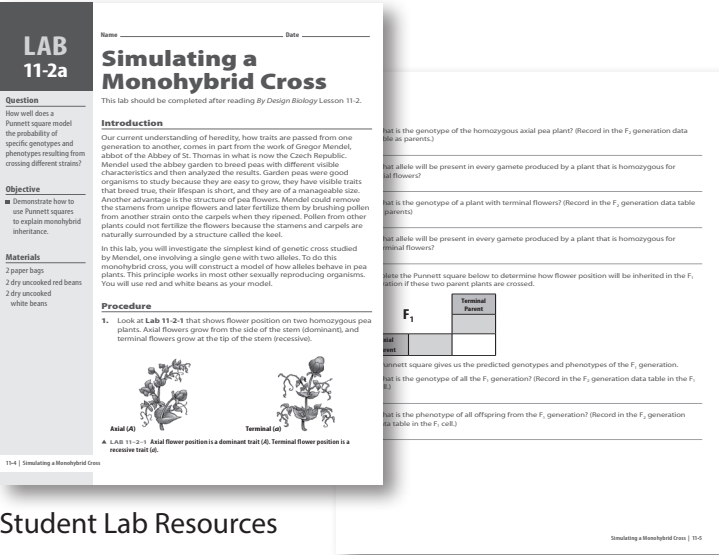
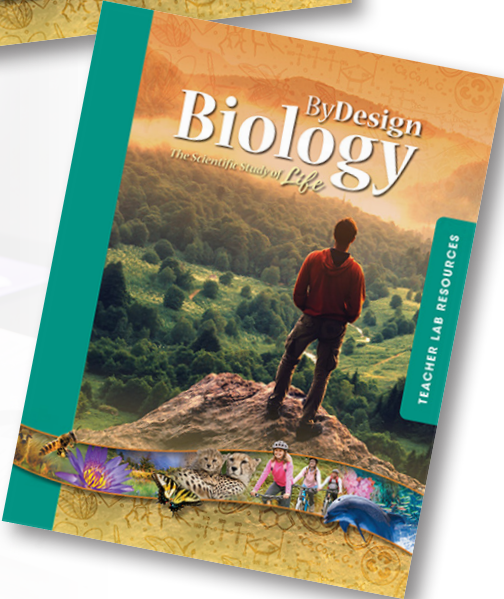
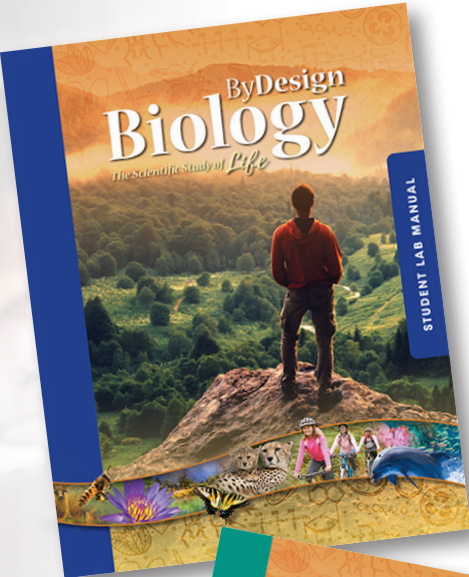


Lab Resources\*

The **Student Lab Resources** are a resource for teachers to provide to each student. Teachers select labs based on the chapter and lesson they are using with their instruction. Labs are organized by chapter and lesson.

The **Teacher Lab Resource** contains instructions for conducting the inquiry labs as well as additional instruction and answers to the questions that appear in the labs.

*\*Printed manuals are available by request for the Teacher Lab Resources and the Student Lab Resources.*



Teacher Lab Resources



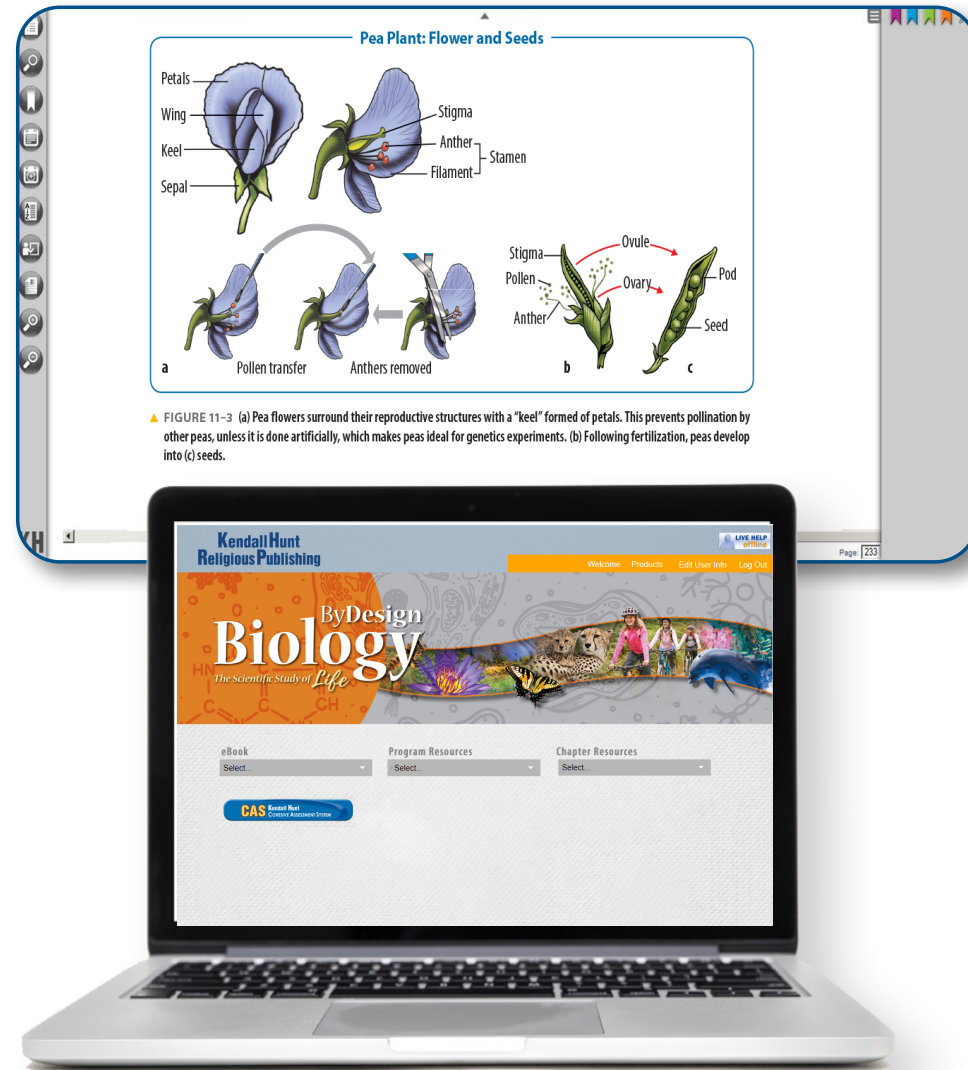
Click here to view  
Sample Pages



## eBooks

The eBooks offer teachers and students access to high-quality content that can be viewed in either single- or double-page mode and can be enlarged for easier viewing. eBook functionality allows students to take notes and highlight key concepts. Links from the table of contents provide quick access to chapters, lessons, glossary definitions, and supporting labs developed to enhance the inquiry experience.

**Flourish** is an online platform that provides you with all the materials for *ByDesign Biology* in a digital format. Everything is available all day, every day through online access so that you can plan at school or at home and your students can learn wherever they are. The student textbook, your teacher edition, and all lab resources needed to complete a lesson are readily accessible at the point of use.



## Table of Contents\*

The *ByDesign Biology* program consists of 27 chapters covering a wide range of essential biology topics, giving teachers and students insight into ecosystems, cell structure and function, genetics, taxonomy, and human biology.

With its clear diagrams, beautiful images, and various extension and review activities, students will be amazed by what they will learn about God's Creation and the scientific principles that help them understand it.



## Introduction

### Chapter 1 Foundations of Biology

**Lesson 1** Worldviews

**Lesson 2** Science

**Lesson 3** Life

### Chapter 2 Biology Connections

**Lesson 1** Connections to Language and Art

**Lesson 2** Connections to History

**Lesson 3** Connections to Other Sciences

**Lesson 4** Divisions of Biology

\* Aligns with the SDA high school curriculum standards and the Next Generation Science Standards (NGSS)





## Ecology and Interdependence

### Chapter 3 Ecosystems

- Lesson 1** Introduction to Ecology
- Lesson 2** Energy Flow in Ecosystems
- Lesson 3** Matter Cycles in Ecosystems
- Lesson 4** Types of Ecosystems

### Chapter 4 Populations and Communities

- Lesson 1** Describing Populations
- Lesson 2** Community Structure and Interactions
- Lesson 3** Ecological Succession

### Chapter 5 Conservation

- Lesson 1** Importance of Biodiversity
- Lesson 2** Humans and the Environment
- Lesson 3** Conservation Biology

Humans are as much a part of nature as every other creature, and we have a specific role to play as part of God's Creation.



## Cell Structure and Processes

### Chapter 6 Molecules of Life

- Lesson 1** Water
- Lesson 2** Carbon
- Lesson 3** Macromolecules

### Chapter 7 Cell Structure and Function

- Lesson 1** Cellular Life
- Lesson 2** Cell Parts
- Lesson 3** Cell Transport

### Chapter 8 Photosynthesis

- Lesson 1** Energy for Life Processes
- Lesson 2** Overview of Photosynthesis
- Lesson 3** The Process of Photosynthesis
- Lesson 4** Variations of Photosynthesis

At its most basic level, life depends on an elegant organization of macromolecules—the building blocks of living things. The structure of these molecules determines how each one functions inside the cell.



## Genetics

### Chapter 9 Cellular Reproduction

- Lesson 1** Overview of Cellular Respiration
- Lesson 2** Process of Cellular Respiration
- Lesson 3** Fermentation and Anaerobic Respiration

### Chapter 10 The Cell Cycle

- Lesson 1** Cell Growth and Reproduction
- Lesson 2** The Cell Cycle
- Lesson 3** DNA Replication
- Lesson 4** Regulation of the Cell Cycle
- Lesson 5** Cell Differentiation

### Chapter 11 Mendelian and Population Genetics

- Lesson 1** Mendelian Genetics
- Lesson 2** Punnett Squares and Probability
- Lesson 3** Mendel's Laws and Their Applications
- Lesson 4** Population Genetics

### Chapter 12 Chromosomes and Inheritance

- Lesson 1** Meiosis
- Lesson 2** Chromosomes and Mutation
- Lesson 3** Tracing Inheritance

### Chapter 13 Gene Expression and Regulation

- Lesson 1** Types of RNA
- Lesson 2** Protein Synthesis
- Lesson 3** Gene Regulation

### Chapter 14 Technology and Bioethics

- Lesson 1** The New Frontier
- Lesson 2** Biotechnology
- Lesson 3** Ethics and Biotechnology

At its core, genetics is about coded information stored in amazingly long strands of DNA. Genetics is also about how that information is transmitted, retrieved, and used to make proteins and other structures that ultimately deem what an organism's body is capable of being.



## Unit

## 4



## Taxonomy

### Chapter 15 Classification

- Lesson 1** Introduction to Classification
- Lesson 2** Methods of Classification
- Lesson 3** Trees of Life

### Chapter 16 Viruses, Prokaryotes, Protists, and Fungi

- Lesson 1** Viruses
- Lesson 2** Prokaryotes
- Lesson 3** Protists
- Lesson 4** Fungi

### Chapter 17 Plants

- Lesson 1** Overview of Plants
- Lesson 2** Plant Structures and Responses
- Lesson 3** Plant Reproduction

### Chapter 18 Invertebrates

- Lesson 1** Introduction to Invertebrates
- Lesson 2** Sponges, Cnidarians, and Ctenophores
- Lesson 3** Flatworms, Roundworms, and Rotifers
- Lesson 4** Mollusks and Annelids
- Lesson 5** Arthropods
- Lesson 6** Echinoderms

### Chapter 19 Vertebrates

- Lesson 1** Introduction to Vertebrates
- Lesson 2** Fish
- Lesson 3** Amphibians and Reptiles
- Lesson 4** Birds
- Lesson 5** Mammals

### Chapter 20 The Fossil Records of Life

- Lesson 1** Fossils
- Lesson 2** Patterns in the Fossil Record
- Lesson 3** Interpreting Fossils

Darwinian evolutionism forces similarities into a universal common ancestry, yet the biblical worldview looks at the diversity of biology as origin by design.

## Unit

## 5



## Human Biology

### Chapter 21 The Human Body and Integument

- Lesson 1** Human Body Organization
- Lesson 2** The Integumentary System

### Chapter 22 The Nervous System

- Lesson 1** The Central Nervous System
- Lesson 2** The Peripheral Nervous System
- Lesson 3** Sensory Systems
- Lesson 4** Behavioral Neuroscience

### Chapter 23 The Skeletal and Muscular Systems

- Lesson 1** The Skeletal System
- Lesson 2** The Muscular System

### Chapter 24 The Circulatory and Respiratory Systems

- Lesson 1** The Circulatory System
- Lesson 2** The Respiratory System

### Chapter 25 The Digestive, Lymphatic, and Immune Systems

- Lesson 1** The Digestive System
- Lesson 2** The Lymphatic System
- Lesson 3** The Immune System

### Chapter 26 The Reproductive, Endocrine, and Urinary Systems

- Lesson 1** The Reproductive System
- Lesson 2** The Endocrine System
- Lesson 3** The Urinary System

The human body is amazing. Its sophisticated organization allows us to experience the world around us and gives us the ability to think, create, and respond in ways that no other creature can.



## Conclusion

### Chapter 27 The Beginning and the End

- Lesson 1** The Beginning
- Lesson 2** How Will You Use Biology
- Lesson 3** The End



# ByDesign Biology

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Educators and students will benefit from this customized, faith-based biology curriculum.

**Kendall Hunt  
Religious Publishing**

**For more information about bringing *ByDesign* Biology to your  
classroom, call 1-800-542-6657 or visit [rpd.kendallhunt.com](http://rpd.kendallhunt.com)**

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