

# Introducing Biology

## Unit Focus

Unit 1 gives you a general understanding of what modern biology is all about and reviews and explains the chemistry of living systems. You will explore scientific thinking, methods, equipment, and experimentation.

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### CHAPTER LABS ONLINE

Manipulating Independent Variables  
Manipulating Plant Growth  
Biology in the News



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Moray eel and cleaner shrimp



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32

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**CHAPTER LABS  
ONLINE**

- Enzymatic Activity
- Testing pH
- Enzymes

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## UNIT 1 BIOZINE When Knowledge and Ethics Collide

60

- Technology** *Genetic Testing*
- Careers** *Geneticist*

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**VIRTUAL Lab**

Chapter 2 Calorimetry



**Animated BIOLOGY**

Chapter 1 Cells Through Different Microscopes, Experimental Design

Chapter 2 Hydrogen Bonding, Energy and Chemical Reactions, Atoms and Bonding

**WebQuest**

Chapter 1 Bioethics

Chapter 2 Prions and Public Health

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Venus flytrap and frog

### Unit Focus

In Unit 2, you will learn about different types of cells, the structures and functions of their specialized parts, energy use in cells, and cell division.

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### CHAPTER LABS ONLINE

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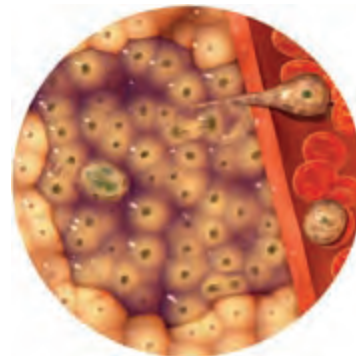
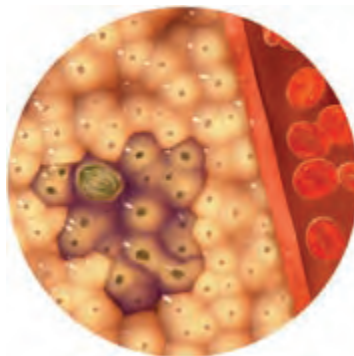
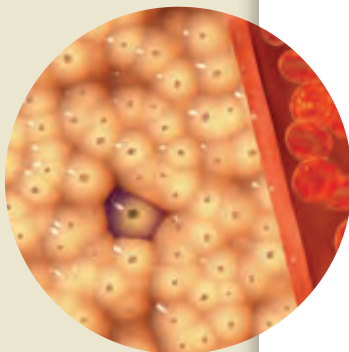
### CHAPTER LABS ONLINE

Rates of Photosynthesis  
Cellular Respiration  
Investigating Fermentation in Foods



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Cancer cells






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### CHAPTER LABS ONLINE

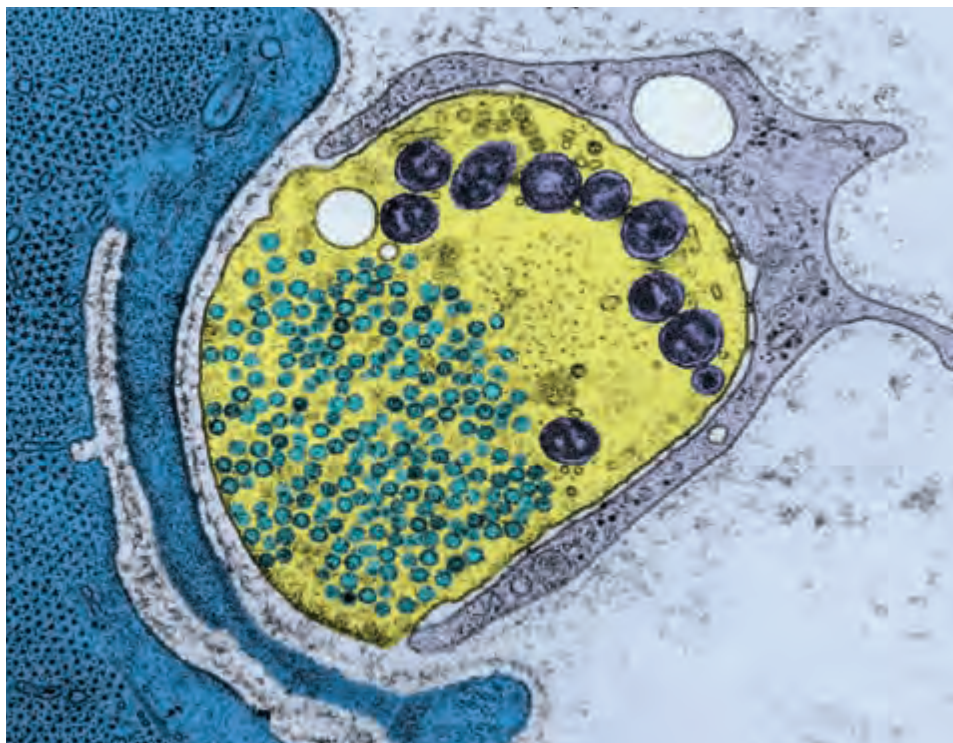
Mitosis in Onion Root Cells  
Modeling Cell Surface Area-to-Volume Ratio  
Apoptosis

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## UNIT 2 BIOZINE Stem Cell Research—Potential Solutions, Practical Challenges 152

**Technology** *Somatic Cell Nuclear Transfer*  
**Careers** *Cell Biologist*

Vesicles in a cell



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**VIRTUAL Lab**

Chapter 4 Carbon Dioxide Transfer Through Snails and Elodea

Chapter 5 Investigating Bacterial Growth

**Animated BIOLOGY**

Chapter 3 Cell Structures, Get Through a Cell Membrane

Chapter 4 Photosynthesis, Cellular Respiration, Mirror Processes

Chapter 5 Binary Fission, Mitosis Stage Matching



**Web Quest**

Chapter 3 Organelle Dysfunction

Chapter 4 Energy and Athletic Training

Chapter 5 Skin Cancer

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### Unit Focus

In Unit 3, you will learn about sources of genetic variation, how the genetic makeup of an individual is determined, how the genetic code is eventually translated into proteins, and how biotechnology can change an organism's DNA.

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### CHAPTER LABS ONLINE

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Royal blue and green betta fish







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### CHAPTER LABS ONLINE

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### CHAPTER LABS ONLINE

Modeling Forensics  
Modeling Genetic Engineering  
Genetic Screening



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## UNIT 3 BIOZINE Medical Technology—The Genetic Forefront 274

**Technology** *Biochips*  
**Careers** *Cancer Geneticist*



### VIRTUAL Lab

Chapter 6 Breeding Mutations in Fruit Flies

Chapter 9 Gel Electrophoresis, Bacterial Transformation

### Animated BIOLOGY

Chapter 6 Meiosis

Chapter 7 Human Chromosomes

Chapter 8 Replicating DNA, Build a Protein

Chapter 9 Restriction Enzymes, Polymerase Chain Reaction



### WebQuest

Chapter 6 Selective Breeding

Chapter 7 Genetic Heritage

Chapter 8 Transgenic Organisms

Chapter 9 Animal Cloning

### INTERACTIVE Review

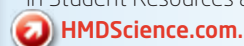
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**Unit Focus**

Unit 4 discusses the basic principles of evolution and natural selection, how populations evolve, and the history of life on Earth.

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**CHAPTER LABS  
ONLINE**

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**CHAPTER LABS  
ONLINE**

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Exploring Adaptations



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### CHAPTER LABS ONLINE

Radioactive Decay  
Stride Inferences  
Understanding Geologic Time

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## UNIT 4 BIOZINE Drug-Resistant Bacteria—A Global Health Issue 366

**Technology** *New Drug Delivery System*  
**Careers** *Evolutionary Biologist*

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**VIRTUAL Lab**

Chapter 12 Comparing Hominoid Skulls

**Animated BIOLOGY**

Chapter 10 Principles of Natural Selection, Natural Selection

Chapter 11 Mechanisms of Evolution, Founder Effect, Evolutionary Arms Race

Chapter 12 Endosymbiosis, Geologic Time Scale



**Web Quest**

Chapter 10 Dinosaur Descendants

Chapter 11 Speciation in Action

Chapter 12 Geologic Dating

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Tarsiers



### Unit Focus


In Unit 5, ecology is defined as the study of interactions among living and nonliving things in an ecosystem. You will learn about various types of interactions and how scientists study them, how Earth is divided into biomes, and how humans can impact ecosystems within these biomes.

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### CHAPTER LABS ONLINE

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Random Sampling  
Build a Terrarium


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### CHAPTER LABS ONLINE

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Limiting Nutrients for Algae  
Making a Local Field Guide

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Industrial pollution





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### CHAPTER LABS ONLINE

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and Soil



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### CHAPTER LABS ONLINE

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Water Quality Testing  
Contamination of Groundwater



Go online for the full complement of labs.

## UNIT 5 BIOZINE Global Warming—Changing the Planet 480

**Technology** *Deep Sea Sediment Coring*  
**Careers** *Oceanographer*



Chapter 13 Estimating  
Population Size

### Animated BIOLOGY

Chapter 13 Build a Food Web  
Chapter 14 Survive within a Niche, What Limits Population Growth?  
Chapter 15 Lake Turnover, Where Do They Live?  
Chapter 16 Human Effects on a Food Web



### Web Quest

Chapter 13 Keystone Species  
Chapter 14 Environmental Stress  
Chapter 15 Explore an Ecosystem  
Chapter 16 Invasive Species

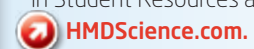
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# Classification and Diversity

## Unit Focus

Unit 6 first introduces the way in which scientists classify living things. Next it begins the exploration of diversity of living things with viruses and prokaryotes, and then protists and fungi.

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### CHAPTER LABS ONLINE

Creating a Dichotomous Key for  
Limpet Shells  
Modeling DNA Hybridization  
Defining Species



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### CHAPTER LABS ONLINE

Leaf Print Bacteria  
Using Bacteria to Break Down Oil  
Modeling Viruses



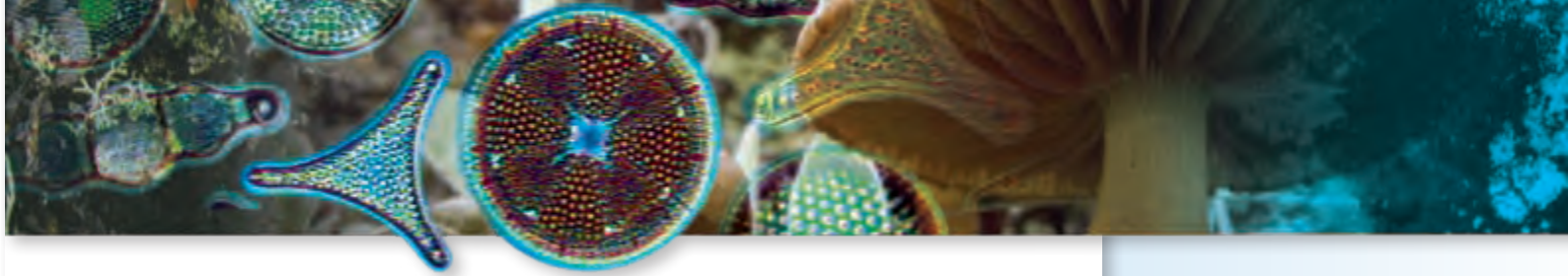
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*Euplotes*, an animal-like protist





## Chapter 19 Protists and Fungi 536

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- 19.2 Animal-like Protists 541
- QUICK LAB** Investigating Motion in Protists 543
- 19.3 Plantlike Protists 545
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- 19.6 Ecology of Fungi 560

**STANDARDS-BASED ASSESSMENT** 567

**CHAPTER LABS ONLINE** Exploring Mushroom Anatomy  
Quantifying Mold Growth  
Algae in Products

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## UNIT 6 BIOZINE Pandemics—Is the Next One on the Way? 568

**Technology** Dissecting a Virus  
**Careers** Epidemiologist

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White oak (*Quercus alba*)

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Chapter 18 Testing Antibacterial Products



**Animated BIOLOGY**

Chapter 17 Molecular Clock, Build a Cladogram

Chapter 18 What Would You Prescribe?

Chapter 19 Protist and Fungus Life Cycles

**Web Quest**

Chapter 17 Classify a Sea Cucumber

Chapter 18 Antibiotics in Agriculture

Chapter 19 Sickening Protists

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### Unit Focus

In Unit 7, you will first learn about the origins and diversity of plant life. Plant physiology is the next focus, followed by plant life cycles and responses.

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### CHAPTER LABS ONLINE

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Comparing Monocots and Dicots  
Investigating Medicinal Plants



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### CHAPTER LABS ONLINE

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Connecting Form to Function



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Double samaras





## Chapter 22 Plant Growth, Reproduction, and Response 620

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**CHAPTER LABS ONLINE** Seed Germination  
Investigating Plant Hormones  
Fruit Dissection

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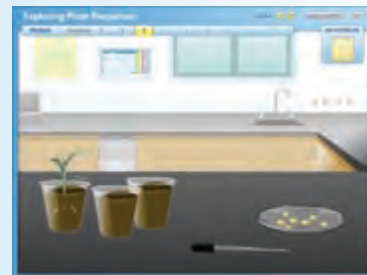
## UNIT 7 BIOZINE Genetically Modified Foods—Do Potential Problems Outweigh Benefits? 646

**Technology** *Gene Gun*  
**Careers** *Research Engineer*

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**VIRTUAL Lab**

Chapter 21 Plant Transpiration  
Chapter 22 Exploring Plant Responses



**Animated BIOLOGY**

Chapter 20 Plant and Pollinator Matching Game  
Chapter 21 Movement Through a Plant  
Chapter 22 Seed Dispersal

**Web Quest**

Chapter 20 Endangered Plants  
Chapter 21 Plant Adaptations  
Chapter 22 Plants in Space

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Prickly pear cactus



**Unit Focus**

Unit 8 begins by discussing the common characteristics of all animals. Animal diversity, including invertebrate and vertebrate diversity, is explored. Then the focus shifts to animal behavior.

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**CHAPTER LABS  
ONLINE**

Feeding Hydra  
Anatomy of a Sea Star  
Anatomy of an Annelid

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**Chapter 24 A Closer Look at Arthropods 682**

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**CHAPTER LABS  
ONLINE**

Hatching Brine Shrimp  
Daphnia and Heart Rate  
Inside a Crayfish

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**CHAPTER LABS  
ONLINE**

Fish Reproduction  
Anatomy of a Bony Fish  
Vanishing Amphibian—an Indicator  
Species

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## Chapter 26 A Closer Look at Amniotes 736

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### CHAPTER LABS ONLINE

A Bird's Airframe  
The Parts of an Egg  
Migration and Range

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## Chapter 27 Animal Behavior 764

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- 27.2 Instinct and Learning 770  
**QUICK LAB** *Human Behavior* 772
- 27.3 Evolution of Behavior 775
- 27.4 Social Behavior 779  
**DATA ANALYSIS** *Constructing Bar Graphs* 784
- 27.5 Animal Cognition 785
- STANDARDS-BASED ASSESSMENT** 791

### CHAPTER LABS ONLINE

Using an Ethogram to Describe Animal Behavior  
Pill Bug Behavior  
Animal Cognition

 **HMDScience.com**  
Go online for the full complement of labs.

## UNIT 8 BIOZINE The Loss of Biodiversity 792

**Technology** *Bioremediation*  
**Careers** *Conservation Biologist*

 **ONLINE BIOLOGY**  
HMDScience.com

### VIRTUAL Lab

- Chapter 24 Insects and Crime Scene Analysis
- Chapter 27 Interpreting Bird Response

### Animated BIOLOGY

- Chapter 23 Digestive Tract Formation, Shared Body Structures
- Chapter 24 What Type of Arthropod?
- Chapter 25 Gas Exchange in Gills, Frog Metamorphosis, What Type of Fish Is It?
- Chapter 26 Beak Shape and Diet
- Chapter 27 Behavioral Costs and Benefits

### Web Quest

- Chapter 23 Parasites
- Chapter 24 Field Guide
- Chapter 25 Fisheries on the Brink
- Chapter 26 Sea Turtles
- Chapter 27 Animal Cognition


### INTERACTIVE Review

Key Concepts, Vocabulary Games, Concept Maps, Animated Biology, Section Self-Checks

### BIOZINE

**INTERNET MAGAZINE**  
Continually updated articles and the latest biology news

Additional labs and a variety of online activities are available in Student Resources at

 **HMDScience.com.**



Pill bugs

# Human Biology

## Unit Focus

In Unit 9, you will learn about how your body systems work together to maintain a stable internal environment. Structures and functions of all the major body systems are addressed.

## Chapter 28 Human Systems and Homeostasis 796

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<b>28.2</b>	Mechanisms of Homeostasis	804
	<b>QUICK LAB</b> <i>Negative Feedback Loop</i>	807
<b>28.3</b>	Interactions Among Systems	808
	<b>DATA ANALYSIS</b> <i>Interpreting Inverse Relationships</i>	811
	<b>STANDARDS-BASED ASSESSMENT</b>	815

### CHAPTER LABS ONLINE

Homeostasis and Exercise  
Examining Human Cells  
Hormones and Homeostasis



**HMDScience.com**

Go online for the full complement of labs.

## Chapter 29 Nervous and Endocrine Systems 816

<b>29.1</b>	How Organ Systems Communicate	818
<b>29.2</b>	Neurons	820
<b>29.3</b>	The Senses	824
<b>29.4</b>	Central and Peripheral Nervous Systems	829
	<b>QUICK LAB</b> <i>The Primary Sensory Cortex</i>	830
<b>29.5</b>	Brain Function and Chemistry	835
	<b>DATA ANALYSIS</b> <i>Correlation or Causation</i>	839
<b>29.6</b>	The Endocrine System and Hormones	840
	<b>STANDARDS-BASED ASSESSMENT</b>	849

### CHAPTER LABS ONLINE

The Stroop Effect  
Reaction Time  
Brain-Based Disorders



**HMDScience.com**

Go online for the full complement of labs.

## Chapter 30 Respiratory and Circulatory Systems 850

<b>30.1</b>	Respiratory and Circulatory Functions	852
<b>30.2</b>	Respiration and Gas Exchange	856
<b>30.3</b>	The Heart and Circulation	859
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	<b>DATA ANALYSIS</b> <i>Forming a Null Hypothesis</i>	867
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	<b>QUICK LAB</b> <i>Blood Cells</i>	870
<b>30.6</b>	Lymphatic System	872
	<b>STANDARDS-BASED ASSESSMENT</b>	877

### CHAPTER LABS ONLINE

Carbon Dioxide and Exercise  
Making and Using a Respirometer  
Stimuli and Heart Rate



**HMDScience.com**

Go online for the full complement of labs.





## Chapter 31 Immune System and Disease 878

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	<b>QUICK LAB</b> <i>How Pathogens Spread</i>	883
31.2	Immune System	885
	<b>DATA ANALYSIS</b> <i>Identifying Experimental Design Flaws</i>	887
31.3	Immune Responses	890
31.4	Immunity and Technology	895
31.5	Overreactions of the Immune System	897
31.6	Diseases that Weaken the Immune System	900
	<b>STANDARDS-BASED ASSESSMENT</b>	907

### CHAPTER LABS ONLINE

Observing Normal and Diseased Tissue  
Modeling T Cell Activation  
What Is an Autoimmune Disease?



Go online for the full complement of labs.

## Chapter 32 Digestive and Excretory Systems 908

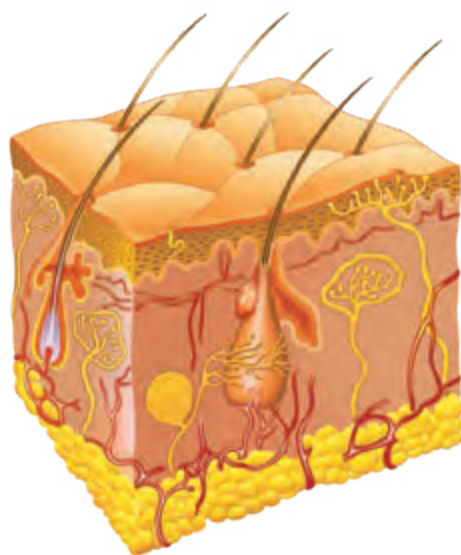
32.1	Nutrients and Homeostasis	910
32.2	Digestive System	915
32.3	Absorption of Nutrients	920
	<b>QUICK LAB</b> <i>Villi in the Small Intestine</i>	921
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32.4	Excretory System	924
	<b>STANDARDS-BASED ASSESSMENT</b>	933

### CHAPTER LABS ONLINE

Testing a Digestive Enzyme  
Antacid Effectiveness  
Digesting Milk



Go online for the full complement of labs.



Layers of skin

**ONLINE BIOLOGY**  
HMDScience.com

**VIRTUAL Lab**

Chapter 30 Blood Typing

**Animated BIOLOGY**

Chapter 28 Human Organ Systems, Keep an Athlete Running

Chapter 29 Nerve Impulse Transmission, Reflex Arc, Diagnose a Hormone Disorder

Chapter 30 How You Breathe, Heart Pumping Blood, Build the Circulatory and Respiratory Systems

Chapter 31 Vaccines and Active Immunity, Destroy the Invaders

Chapter 32 Run the Digestive System

**Web Quest**

Chapter 28 Hypothermia

Chapter 29 Drug Addiction

Chapter 30 Asthma

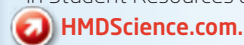
Chapter 31 HIV and AIDS

Chapter 32 Obesity

**INTERACTIVE Review**

Key Concepts, Vocabulary Games, Concept Maps, Animated Biology, Section Self-Checks

Additional labs and a variety of online activities are available in Student Resources at



# Human Biology *continued*

## Animated BIOLOGY

Chapter 33 Muscle Contraction, What Kind of Joint Is It?

Chapter 34 Developmental Timeline

## WebQuest

Chapter 33 Muscular Dystrophy

Chapter 34 Healthy Diet, Healthy Baby

## INTERACTIVE Review


Key Concepts, Vocabulary Games, Concept Maps, Animated Biology, Section Self-Checks

## BIOZINE

### INTERNET MAGAZINE

Continually updated articles and the latest biology news

Additional labs and a variety of online activities are available in Student Resources at

 [HMDScience.com](http://HMDScience.com).



Sperm and egg

## Chapter 33 Protection, Support, and Movement 934

33.1	Skeletal System	936
33.2	Muscular System	942
	<b>QUICK LAB</b> <i>Muscles and Bones of the Skull</i>	947
33.3	Integumentary System	949
	<b>DATA ANALYSIS</b> <i>Analyzing Trends in Data</i>	950
	<b>STANDARDS-BASED ASSESSMENT</b>	955

### CHAPTER LABS ONLINE

Muscle Fatigue  
Muscles in Action  
Bone and Muscle Cells


 [HMDScience.com](http://HMDScience.com)  
Go online for the full complement of labs.

## Chapter 34 Reproduction and Development 956

34.1	Reproductive Anatomy	958
34.2	Reproductive Processes	961
	<b>QUICK LAB</b> <i>Human Sex Cells</i>	965
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	<b>DATA ANALYSIS</b> <i>Interpreting Graphs</i>	972
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	<b>STANDARDS-BASED ASSESSMENT</b>	981

### CHAPTER LABS ONLINE

Hormones in the Human Menstrual Cycle  
Development of an Embryo  
Effects of Chemicals on Reproductive Organs

 [HMDScience.com](http://HMDScience.com)  
Go online for the full complement of labs.

## UNIT 9 BIOZINE Brain Science—We Are Wired to Learn! 982

**Technology** *Scanning the Brain*  
**Careers** *Neuroscientist*

## Student Resources R1

Lab Handbook	R2
Math and Data Analysis Handbook	R14
Vocabulary Handbook	R18
Note-taking Handbook	R22
Appendices	R27
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# Data Analysis

**Smart Grapher**  
HMDSscience.com  
**PREMIUM CONTENT**  
Use Smart Grapher to create animated charts and graphs.

The Data Analysis activity in each chapter helps you develop skills you need to analyze data from scientific investigations.

## Introducing Biology

Qualitative and Quantitative	12
Identifying Variables	47

## Cells

Defining Variables	76
Interpreting Graphs	110
Constructing Data Tables	134

## Genetics

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Interpreting Histograms	220
Constructing Histograms	266

## Evolution

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## Ecology

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Discrete and Continuous Data	467

## Classification and Diversity

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## Plants

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Identifying the Importance of Repeated Trials	609
Identifying Experimental Design Flaws	632

## Animals

Analyzing Scatterplots	677
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## Human Biology

Interpreting Inverse Relationships	811
Correlation or Causation	839
Forming a Null Hypothesis	867
Identifying Experimental Design Flaws	887
Identifying Outliers	923
Analyzing Trends in Data	950
Interpreting Graphs	972

Jane Goodall and chimpanzee





# QuickLabs

Explore key concepts and develop basic lab skills using these QuickLabs.

## Introducing Biology

Life Under a Microscope	Observing	22
Chemical Bonding	Modeling	49

## Cells

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Fermentation	Design Your Own	118
Cancer	Observing	139

## Genetics

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## Evolution

Piecing Together Evidence	Inferring	295
Genetic Drift	Modeling	317
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## Ecology

Quadrat Sampling	Sampling	375
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Modeling Biomagnification	Modeling	466

## Classification and Diversity

Construct a Cladogram	Classifying	493
Examining Bacteria in Yogurt	Observing	526
Investigating Motion in Protists	Observing	543

## Plants

Classifying Plants as Vascular or Nonvascular	Classifying	582
Chlorophyll Fluorescence	Analyzing	614
A Closer Look at Flowers	Dissecting	627

## Animals

Anatomy of a Clam	Observing	670
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## Human Biology

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Blood Cells	Observing	870
How Pathogens Spread	Modeling	883
Villi in the Small Intestine	Modeling	921
Muscles and Bones of the Skull	Interpreting Graphics	947
Human Sex Cells	Observing	965

