

## Biology, Semester A

### Course Overview

Biology, Semester A, is a single-semester course designed to strengthen your knowledge of basic biology. The first unit provides an introduction to biology and biochemistry. It focuses on the roles of and differences between plant and animal cells. In the second unit, you'll learn about the functions of different organ systems. The third unit covers cell division and the role of DNA and chromosomes in passing traits from parents to offspring.

### Course Goals

By the end of this course, you will be able to do the following:

- Use the scientific method to investigate a biology question.
- Explain how atoms combine to form larger molecules that have various biological functions.
- Explain the structural and functional differences between plant and animal cells.
- Explain how different proteins produced by a cell carry out critical life functions through systems of specialized cells.
- Explain the working of nervous, skeletal and muscle, respiratory, circulatory, digestive, excretory, integumentary, immune, lymph, and endocrine systems with the help of models.
- Explain how human reproduction is controlled by anatomical and biochemical processes.
- Explain the role of mitosis and meiosis in producing and maintaining complex organisms.
- Explain the role of DNA and chromosomes in passing traits from parents to offspring.
- Use statistics and probability to calculate variation and distribution of expressed traits in a population.

## General Skills

To participate in this course, you should be able to do the following:

- Complete basic operations with word-processing software, such as Microsoft Word or Google Docs.
- Understand the basics of spreadsheet software, such as Microsoft Excel or Google spreadsheets, but prior computing experience is not necessary.
- Perform online research using various search engines and library databases.
- Communicate through email and participate in discussion boards.

*For a complete list of general skills that are required for participation in online courses, refer to the Prerequisites section of the Student Orientation document, found at the beginning of this course.*

## Credit Value

Biology A is a 0.5-credit course.

## Course Materials

- notebook
- computer with Internet connection and speakers or headphones
- Microsoft Word or equivalent
- Microsoft Excel or equivalent
- Microsoft PowerPoint or equivalent
- materials listed in Appendix B (Appendix C provides a detailed breakdown of these materials per activity.)

## Course Pacing Guide

This course description and pacing guide is intended to help you stay on schedule with your work. Note that your course instructor may modify the schedule to meet the specific needs of your class.

## Unit 1: Cells

### Summary

The first unit will introduce biology and biochemistry. You'll analyze how atoms combine to play important roles in various biological functions. You'll investigate structures of different organisms using a compound microscope, and explain the cell theory and

difference between prokaryotic and eukaryotic cells. You'll present a scientific argument supporting or opposing the view that AIDS currently meets the definition of a pandemic. Finally, you'll explain the importance of different proteins in carrying out critical life functions through systems of specialized cells.

Day	Activity/Objective	Type
1 day: 1	<b>Syllabus and Student Orientation</b> <i>Review the Student Orientation and Course Syllabus at the beginning of this course.</i>	Course Orientation
3 days: 2–4	<b>Introduction to Biology</b> <i>Use the scientific method to investigate a biology question.</i>	Lesson
3 days: 5–7	<b>Introduction to Biochemistry</b> <i>Explain how atoms combine to form larger molecules that have various biological functions.</i>	Lesson
4 days: 8–11	<b>Using a Microscope</b> <i>Use a compound microscope to investigate structures of different organisms.</i>	Course Activity
3 days: 12–14	<b>Cells: The Basic Units of Life</b> <i>Explain cell theory and the differences between prokaryotic and eukaryotic cells.</i>	Lesson
4 days: 15–18	<b>The AIDS Epidemic</b> <i>Construct and present a scientific argument supporting or opposing the view that AIDS currently meets the definition of a pandemic.</i>	Course Activity
4 days: 19–22	<b>Cell Processes and Transport</b> <i>Explain how different proteins produced by a cell carry out critical life functions through systems of specialized cells.</i>	Lesson
5 days: 23–27	<b>Unit Activity and Discussion—Unit 1</b>	Unit Activity/ Discussion

Day	Activity/Objective	Type
1 day: 28	<b>Posttest—Unit 1</b>	Assessment

## Unit 2: Organ Systems

### Summary

This unit discusses the functions of various organ systems. You'll study the nervous system and explore the working of the musculoskeletal system with the help of models. You'll analyze the effects of exercise on heart rate and muscle activity. You'll develop a model to show how the circulatory and respiratory systems work together to provide oxygen to the body. You'll also develop a model to explain how the digestive and excretory systems interact with the circulatory system to provide energy to cells and eliminate waste. You'll test the effectiveness of an enzyme under different conditions. Finally, you'll use models to explain the regulation of the body, maintenance of homeostasis, and human reproduction.

Day	Activity/Objective	Type
3 days: 29–31	<b>The Nervous System</b> <i>Develop and use a model to show how the nervous system processes and responds to stimuli from all other body systems.</i>	Lesson
3 days: 32–34	<b>The Skeletal and Muscle Systems</b> <i>Develop and use a model to explain how the musculoskeletal system works with the nervous system for movement and support.</i>	Lesson
4 days: 35–38	<b>The Effects of Exercise on Muscles and Heart Rate</b> <i>Plan and conduct an investigation to explain how exercise affects heart rate and muscle activity.</i>	Course Activity
4 days: 39–42	<b>The Respiratory and Circulatory Systems</b> <i>Develop a model to show how the circulatory and respiratory systems work together to provide oxygen to the body.</i>	Lesson

Day	Activity/Objective	Type
3 days: 43–45	<b>The Digestive and Excretory Systems</b> <i>Use a model to explain how the digestive and excretory systems interact with the circulatory system to provide energy to cells and eliminate waste.</i>	Lesson
4 days: 46–49	<b>Enzymes</b> <i>Conduct an investigation that tests the effectiveness of an enzyme under different conditions.</i>	Course Activity
3 days: 50–52	<b>The Integumentary, Immune, Lymph and Endocrine Systems</b> <i>Use models to explain how the integumentary, immune, lymph, and endocrine systems regulate the body and maintain homeostasis.</i>	Lesson
3 days: 53–55	<b>Human Reproduction and Development</b> <i>Use models to explain how human reproduction is controlled by anatomical and biochemical processes.</i>	Lesson
5 days: 56–60	<b>Unit Activity and Discussion—Unit 2</b>	Unit Activity/ Discussion
1 day: 61	<b>Posttest—Unit 2</b>	Assessment


## Unit 3: Heredity

### Summary

In the last unit, you'll study the role of cell division in producing and maintaining complex organisms. You'll learn about the importance of DNA and chromosomes in passing traits from parents to offspring. Then, you'll research a cure for cancer. You'll also analyze evidence that inheritable genetic variations may result from genetic mutations. You'll calculate the probability of expressed traits in a population. Finally, you'll use statistics and probability to calculate variation and distribution of expressed traits in a population.

Day	Activity/Objective	Type
3 days: 62–64	<b>Mitosis and Meiosis</b> <i>Use a model to illustrate the role of mitosis and meiosis in producing and maintaining complex organisms.</i>	Lesson
3 days: 65–67	<b>Genes: The Heredity Code</b> <i>Ask questions to clarify the role of DNA and chromosomes in passing traits from parents to offspring.</i>	Lesson
4 days: 68–71	<b>The Cure for Cancer</b> <i>Present evidence to answer questions about the search for a cancer cure.</i>	Course Activity
4 days: 72–75	<b>Genetic Mutations</b> <i>Make and defend a claim based on evidence that inheritable genetic variations may result from genetic mutations.</i>	Lesson
4 days: 76–79	<b>Genetic Models</b> <i>Develop genetic models to calculate the probability of expressed traits in a population over several generations.</i>	Course Activity
3 days: 80–82	<b>Inheritance Patterns and Genetic Research</b> <i>Use statistics and probability to calculate variation and distribution of expressed traits in a population.</i>	Lesson
5 days: 83–87	<b>Unit Activity and Discussion—Unit 3</b>	Unit Activity/ Discussion
1 day: 88	<b>Posttest—Unit 3</b>	Assessment
1 day: 89	<b>Semester Review</b>	
1 day: 90	<b>End-of-Semester Exam</b>	Assessment

## Appendix A: Safety Notes and Disclaimer

Each Course Activity and Unit Activity that includes a lab or experiment component will highlight key safety guidelines using the safety icon () , which appears directly in the activity. In addition to adhering to those guidelines, you must ensure that you follow these general safety practices:

- Work slowly and safely at all times, and abide by the safety notes and icons.
- Pay attention and be alert at all times. Limit any distractions.
- Keep your hands away from your nose, eyes, mouth, and other skin. Wash your hands before and after experiments.
- If you don't understand something, ask a teacher or an adult before proceeding.
- Wear the required protective gear.
- Adult supervision is required for all activities involving an experiment or lab component.
- Do not perform experiments that have not been approved. Follow the procedures.
- Follow good housekeeping practices. Keep your work area clean.
- Abide by all disposal instructions and icons to protect yourself and our planet.
- Report any problems or complications to an adult.

**NOTE:** *Edmentum assumes no liability for personal injury, death, property damage, equipment damage, or financial loss resulting from the instruction included in this course.*

## Appendix B: Course Lab Materials (Semesters A and B)

### Household Materials

- pen or pencil
- colored pencils or markers
- white paper
- plastic wrap
- construction paper (4 different colors—about 2 sheets of each color)
- scissors
- masking tape
- ruler with a metric scale
- measuring cup (1 cup, graduated)
- measuring spoon set (at least one tablespoon and one teaspoon)
- clock with a second-hand timer
- stopwatch (could be a mobile app or on a computer)
- lunch-sized microwaveable container (about 5 inches wide x 4.25 inches high x 3 inches long)
- oven mitts
- tap water
- granulated sugar
- milk (any variety)
- word-processing or graphic-design software
- presentation software

### Household Materials – Less Common

The italicized materials below are available as a convenience in the *Edmentum Biology Kit*.

- poster board
- corkboard
- modeling clay
- firm stress ball or tennis ball
- 5 (0.25-ounce) packets dry yeast
- 5 24-ounce clear drinking glasses (either glass or plastic, as long as they can safely hold hot water)
- food thermometer (must go up to 100° Fahrenheit)
- kitchen scale (with 0.1 gram accuracy)
- photo-editing software
  
- *safety goggles*
- *disposable safety gloves*

## Science Laboratory Materials

All materials listed in italics below are available in the *Edmentum Biology Kit with Microscope*.

- *compound microscope*
- *allium root tip specimen* (or 1 slide of a plant tissue specimen)
- *cork section specimen* (or 1 slide of a plant tissue specimen)
- *Zea mays leaf specimen* (or 1 slide of a plant tissue specimen)
- *human blood smear specimen* (or 1 animal tissue specimen)
- *cardiac muscle specimen* (or 1 animal tissue specimen)
- *frog skin specimen* (or 1 animal tissue specimen)
- *paramecium specimen* (or 1 slide of a single-celled organism specimen)
- *3 400-milliliter beakers* (or 3 plastic pint glasses)
- *3 test tubes* (or seven 3-ounce disposable paper cups)
- *100-milliliter graduated cylinder* (or a 1-cup measuring cup)
- *10-milliliter graduated cylinder*
- *1 stirrer* (or spoon)
- *glucose test strips* (may be purchased at any drugstore)
- *2 lactase pills* (can be found in the dietary section of any drugstore)
- *insect specimens in solution (15 diverse insects)*
- *insect dichotomous key*
- *4 petri dishes*
- *4 fossil samples*
- *forceps*
- *magnifying glass*

## Appendix C: Lab Materials by Activity (Semester A)

The italicized materials listed below are available in the *Edmentum Biology Kit with Microscope*.

Unit	Activity Name	Task	Equipment List
1	Course Activity: Using a Microscope  <b>* <i>Special lab materials required. (Edmentum Biology Kit with Microscope or school-provided lab materials)</i></b>	Task: Using a Microscope	Italicized items are found in the <i>Edmentum Biology Kit's</i> bag labeled "Using a Microscope," and the box labeled "Microscope." <ul style="list-style-type: none"> <li>• <i>compound microscope</i></li> <li>• <i>allium root tip</i> (or 1 slide of a plant tissue specimen)</li> <li>• <i>cork section</i> (or 1 slide of a plant tissue specimen)</li> <li>• <i>Zea mays leaf</i> (or 1 slide of a plant tissue specimen)</li> <li>• <i>human blood smear</i> (or 1 animal tissue specimen)</li> <li>• <i>cardiac muscle</i> (or 1 animal tissue specimen)</li> <li>• <i>frog skin</i> (or 1 animal tissue specimen)</li> <li>• <i>paramecium</i> (or 1 slide of a single-celled organism specimen)</li> </ul>
1	Course Activity: The AIDS Epidemic	Task: Planning and Creating a Presentation	presentation software
1	Unit Activity: Cells	Task: Evaluating Influenza Vaccine Recommendations	none
2	Course Activity: The Effects of Exercise on Muscles and Heart Rate	Task 1: Measuring Pulse	<ul style="list-style-type: none"> <li>• stopwatch (could be a mobile app or on a computer)</li> <li>• paper</li> <li>• pen or pencil</li> </ul>
		Task 2: Testing Muscle Fatigue	<ul style="list-style-type: none"> <li>• stopwatch (could be a mobile app or on a computer)</li> <li>• clock with a second-hand timer</li> <li>• firm stress ball or tennis ball</li> <li>• paper</li> <li>• pen or pencil</li> </ul>

Unit	Activity Name	Task	Equipment List
		Task 3: Planning an Investigation	none
2	Course Activity: Enzymes  <b>* <i>Special lab materials required. (Edmentum Biology Kit or school-provided lab materials)</i></b>	Task: Enzymes	<p>Italicized items are found in the <i>Edmentum Biology Kit's</i> bags labeled "Enzymes" and "Common Materials."</p> <ul style="list-style-type: none"> <li>• 3 400-milliliter beakers (or 3 plastic pint glasses)</li> <li>• 3 test tubes (or seven 3-ounce disposable paper cups)</li> <li>• 100-milliliter graduated cylinder (or a 1-cup measuring cup)</li> <li>• 10-milliliter graduated cylinder</li> <li>• 1 stirrer (or a spoon)</li> <li>• glucose test strips (or may be purchased at any drugstore)</li> <li>• 2 lactase pills (or may be found in the dietary section of any drugstore)</li> <li>• safety goggles</li> <li>• 1 lunch-sized microwaveable container (about 5 inches wide x 4.25 inches high x 3 inches long)</li> <li>• oven mitts</li> <li>• 3 tablespoons sugar</li> <li>• ¼ cup milk (any variety)</li> <li>• 250 milliliters water (1 cup)</li> <li>• masking tape</li> <li>• pen</li> </ul>
2	Unit Activity: Organ Systems	Task: Modeling Organ Systems	<p>If students choose to make a model on paper, the following materials will be needed:</p> <ul style="list-style-type: none"> <li>• paper</li> <li>• colored pencils or markers</li> <li>• photo-editing software</li> <li>• modeling clay</li> <li>• poster board</li> <li>• corkboard</li> <li>• scissors</li> <li>• ruler with a metric scale</li> </ul>
3	Course Activity: The Cure for Cancer	Task: Planning and Writing a Research Paper	none

Unit	Activity Name	Task	Equipment List
3	Course Activity: Genetic Models	Task 1: Predicting Trait Inheritance	none
		Task 2: Modeling Chromosome Inheritance	<ul style="list-style-type: none"> <li>• construction paper (4 different colors—about 2 sheets of each color)</li> <li>• 4 pens or markers of different colors</li> <li>• scissors (optional)</li> <li>• tape (optional)</li> </ul>
3	Unity Activity: Heredity	Task: Using the Gene Database	none