

Life Science, Semester A

Course Overview

Life Science deals with the study of all types of living organisms, such as microorganisms, plants, animals, and humans. The field focuses on their organization and life processes. Life Science A begins with the basic unit of life—the cell. You'll discover how cells build up tissues, organs, and systems. You will study the growth and development processes of different organisms and see how genes are responsible for the traits of organisms. You'll also explore natural selection and artificial selection and their effects on the genetic traits of organisms.

Course Goals

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

- Use the steps of the scientific method to plan an investigation, use evidence to explain that living things are made up of cells, and create a model that shows cellular organelles.
- Conduct an investigation of cells and use evidence to argue that the human body is made up of tissues, organs, and systems.
- Gather and use information to explain that sensory receptors respond to stimuli by sending messages to the brain.
- Use life cycle models to compare and contrast the growth and development of different organisms.
- Develop models to describe the similarities and differences between the two types of reproduction.
- Perform an experiment and use the results to predict whether a cabbage plant will be genetically identical or different from its parents, and identify the reproductive parts of a flower.
- Develop an argument that explains how animal behaviors and special plant structures affect an organism's chances for reproduction.
- Create a Venn diagram to compare the characteristics of different types of organisms.
- Evaluate your own genetic characteristics, investigate different patterns of inheritance, and identify the causes and effects of genetic mutations.
- Construct an explanation that describes how some traits increase an individual's probability of surviving.

- Gather and use information to explain how technology has changed the way humans influence the traits of organisms.
- Explain why genetic diversity allows a species to adapt to its environment, and create an explanation to show the causes and effects of shifting genetic diversity.

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.
- 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 Plato Student Orientation document, found at the beginning of this course.

Credit Value

Life Science A is a 0.5-credit course.

Course Materials

- notebook
- calculator
- computer with Internet connection and speakers or headphones
- Microsoft Word or equivalent
- Microsoft PowerPoint or equivalent

Course Pacing Guide

This course description and pacing guide is intended to help you keep 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

In this unit, you'll explore the basic unit of life—the cell. At the beginning of the unit, you'll use the scientific method and learn about the theories and scientific tools that are relevant to life science. You'll then learn about cells and their internal structures. You'll observe plant and animal cells, and create a model of their parts. You'll also learn about how cells make up tissues, organs, and important systems of the body.

Day	Activity/Objective	Type
1 day: 1	Syllabus and Plato Student Orientation <i>Review the Plato Student Orientation and Course Syllabus at the beginning of this course.</i>	Course Orientation
3 days: 2–4	Methods of Science <i>Use the steps of the scientific method to plan an investigation that answers a life science question.</i>	Lesson
3 days: 5–7	Cells: The Building Blocks of Life <i>Use evidence about the characteristics of organisms to explain that all living things are made up of cells.</i>	Lesson
4 days: 8–11	The Parts of a Cell <i>Create a model that shows how the parts of a cell contribute to its function.</i>	Lesson
4 days: 12–15	Examining Cells <i>Conduct an investigation to provide evidence that living things are made of cells.</i>	Course Activity
4 days: 16–19	Tissues, Organs, and Systems <i>Use evidence to argue that the human body is made up of tissues, organs, and systems.</i>	Lesson
4 days: 20–23	Infectious Diseases and Vaccines <i>Research a vaccine and present a scientifically sound argument about its value to public health.</i>	Course Activity
3 days: 24–26	Sensory Receptors <i>Gather and use information to explain that sensory receptors respond to stimuli by sending messages to the brain.</i>	Lesson
5 days: 27–31	Unit Activity and Discussion—Unit 1	Unit Activity/ Discussion
1 day: 32	Posttest—Unit 1	Assessment

Unit 2: The Life Cycle

Summary

The focus of this unit is reproductive structures and strategies in different organisms. At the start of the unit, you'll study life cycles of animals and plants. Next, you'll learn about the two kinds of reproduction and explore their similarities and differences. You'll also investigate the strategies and behaviors adopted by animals in order to reproduce. The two Course Activities in this unit will give you an opportunity to explore the reproductive capabilities and structures of plants.

Day	Activity/Objective	Type
4 days: 33–36	The Growth and Development of Organisms <i>Use life cycle models to compare and contrast the growth and development of different organisms.</i>	Lesson
4 days: 37–40	Reproduction in Cabbage Plants <i>Perform an experiment and use the results to develop a model that predicts whether a cabbage plant will be genetically identical or different from its parent(s).</i>	Course Activity
3 days: 41–43	Types of Reproduction <i>Develop models to describe the similarities and differences between asexual and sexual reproduction.</i>	Lesson
4 days: 44–47	Identifying Reproductive Structures in Plants <i>Identify the parts of flowers used for reproduction.</i>	Course Activity
4 days: 48–51	Reproductive Structures and Strategies <i>Develop an argument that explains how animal behaviors and special plant structures affect an organism's chances for reproduction.</i>	Lesson
5 days: 52–56	Unit Activity and Discussion—Unit 2	Unit Activity/ Discussion
1 day: 57	Posttest—Unit 2	Assessment

Unit 3: Genes

Summary

This unit deals with the important aspects of genetics. You'll evaluate your own genetic characteristics and determine the probability of inheriting certain traits. Then you'll learn how genetic characteristics are related to genes, chromosomes, genotype, and phenotype. You'll learn about dominant and recessive traits and the difference between homozygous and heterozygous genes. Next, you'll discover the types, causes, and effects of genetic mutations. In a Course Activity, you'll research the adaptations of two different organisms and compare them. You'll determine the effects of natural and artificial selection and see how genetic diversity plays a significant role in helping a species adapt to its ever-changing environment.

Day	Activity/Objective	Type
4 days: 58–61	Your Genetic Traits <i>Create Punnett squares and genetic flowchart models to calculate the probability that an offspring will inherit a specific trait.</i>	Course Activity
4 days: 62–65	Introduction to Genes <i>Investigate different patterns of inheritance and predict the genetic inheritance of offspring.</i>	Lesson
4 days: 66–69	Genetic Mutations <i>Identify the causes and effects of genetic mutations.</i>	Lesson
4 days: 70–73	Identifying Adaptations <i>Compare and contrast the adaptations of two different organisms that live in different environments.</i>	Course Activity
3 days: 74–76	Natural Selection <i>Construct an explanation that describes how some traits increase an individual's probability of surviving and reproducing in its environment.</i>	Lesson
3 days: 77–79	Artificial Selection <i>Gather and use information to explain how technology has changed the way that humans influence the traits of organisms.</i>	Lesson

3 days: 80–82	Genetic Diversity <i>Explain why genetic diversity allows a species to adapt to its environment.</i>	Lesson
5 days: 83–87	Unit Activity and Discussion—Unit 3	Unit Activity/ Discussion
1 day: 88	Posttest—Unit 3	Assessment
1 day: 89	Semester Review	
1 day: 90	End-of-Semester Exam	Assessment

Appendix A: Safety Notes and Disclaimer

Each Course Activity and Unit Activity that includes a lab/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 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/lab component.
- Do not perform experiments that have not been approved. Follow the procedure.
- 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: Equipment List for Course Activities and Unit Activities

Unit	Activity Name	Task	Equipment List
1	Course Activity: Examining Cells	Task 1: Modeling Animal Cells	<ul style="list-style-type: none"> • 1 clear glass (16 ounce or larger) • 1 cup vinegar • 1 large egg • spoon • flashlight or desk lamp
		Task 2: Magnifying Living Things	<ul style="list-style-type: none"> • magnifying glass (at least 10x magnification) • a leaf • a twig or tree bark • the skin on your hand • a flower • a strand of your own hair (or a sample of pet hair, if you have a dog or cat) • a sample of your choice
		Task 3: Observing Onion Cells and Bacteria under a Microscope	<ul style="list-style-type: none"> • 1 red onion • 1 compound optical microscope (three magnifications, 300x, 600x, 1200x) • 3 microscope slides • 3 cover slips • 1 8-ounce container yogurt with live active cultures • ½ cup water • iodine • knife • tweezers • 1 teaspoon salt
1	Course Activity: Infectious Diseases and Vaccines	Planning and Creating a Presentation	None

Unit	Activity Name	Task	Equipment List
1	Unit Activity: Cells	Testing the Effectiveness of a Hand Sanitizer	<ul style="list-style-type: none"> • 1 cup of water • 1 bouillon cube • 2 teaspoons of sugar • 1 tablespoon of agar or 2 8-ounce packages of plain, unflavored gelatin • a 1-quart microwaveable container • oven mitts • a measuring cup • 4 ½-cup (75 mL) plastic containers (snack-sized or mini food containers) • liquid hand soap • clean towel • alcohol-based hand sanitizer • 4 cotton swabs • masking tape or sticky notes • pen or pencil • disinfectant (such as bleach) • rubber gloves (such as dishwashing gloves)
2	Course Activity: Reproduction in Cabbage Plants	Modeling Reproduction in Cabbage	<ul style="list-style-type: none"> • 1 head green cabbage (with stem attached) • small steak knife • cutting board • 3 gallon-size clear plastic bags • spray bottle and water (about 1 cup) • 3 paper towels
2	Course Activity: Identifying Reproductive Structures in Plants	Task 1: The Parts of a Flower	<ul style="list-style-type: none"> • a microscope (preferred) or a magnifying glass • 1 flower from a flowering plant of your choice (a flower with large parts, such as a daylily or a tulip, is preferred) • 2 microscope slides • 2 coverslips • a glass plate (if using a magnifying glass instead of a microscope) • a scalpel or a small steak knife

Unit	Activity Name	Task	Equipment List
		Task 2: Characteristics of Pinecones	<ul style="list-style-type: none"> • 2 real pinecones (from nature or from a craft store) • 2 clear 16-ounce glasses • 1 cup cold water • 1 cup hot water
2	Unit Activity: The Life Cycle	Create a Venn Diagram	None
3	Course Activity: Your Genetic Traits	Task 1: Analyzing Genetic Traits	None
		Task 2: Creating a Genetic Pedigree Chart	None
3	Course Activity: Identifying Adaptations	Writing a Research Paper	None
3	Unit Activity: Genes	Planning and Creating a Presentation	None

Life Science, Semester B

Course Overview

Life Science deals with the study of all types of living organisms, such as microorganisms, plants, animals, and humans. In Life Science B, you will learn how life evolved on Earth. You'll analyze fossil data to determine the evidence it provides about evolution. You'll study ecosystems, the flow of energy in an ecosystem, and the various relationships in an ecosystem. In addition, you will discover the interdependence that is present in all ecosystems. At the end of the semester, you'll determine the effects that humans and environmental factors have on the ecosystems and devise solutions to protect the biodiversity of ecosystems from these effects.

Course Goals

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

- Model the geological process that makes fossils from leaves.
- Explain how the characteristics of living and extinct organisms can be used to construct an evolutionary lineage.
- Classify organisms based on their shared characteristics, and explain why embryos and anatomical similarities of different species provide evidence of evolution.
- Explain the role of photosynthesis in the cycling of matter and flow of energy, and develop a model that shows how organisms use food to create energy for growth and development.
- Plan an investigation that answers a scientific question about the growth needs of yeast.
- Construct an explanation that relates the influence of environment and genes on the growth of organisms.
- Identify relationships between organisms in ecosystems, and analyze the cause-and-effect relationships between the availability of resources and the growth of organisms in an ecosystem.
- Understand how changes to the physical or biological components of an ecosystem affect populations of organisms, and research one effect that humans have on the ocean's ecosystem.
- Evaluate solutions to maintain biodiversity in an ecosystem and design a solution to an environmental problem in an ecosystem.

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 having 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 Plato Student Orientation document, found at the beginning of this course.

Credit Value

Life Science B is a 0.5-credit course.

Course Materials

- notebook
- calculator
- computer with Internet connection and speakers or headphones
- Microsoft Word or equivalent
- Microsoft PowerPoint or equivalent

Course Pacing Guide

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

Unit 1: Evolution

Summary

This unit focuses on the evolution of different organisms. At the beginning of the unit, you will use real leaves and sticks to model fossil formation. You'll learn how fossils are formed. You'll classify organisms based on their characteristics. You'll compare the embryonic development and anatomy of different species and explain how anatomical similarities give evidence of evolution.

Day	Activity/Objective	Type
1 day: 1	Syllabus and Plato Student Orientation <i>Review the Plato Student Orientation and Course Syllabus at the beginning of this course.</i>	Course Orientation
4 days: 2–5	Fossils and Coal Formation <i>Model the geological process that makes fossils from leaves.</i>	Course Activity
4 days: 6–9	What Is Evolution? <i>Explain how the characteristics of living and extinct organisms can be used to construct an evolutionary lineage.</i>	Lesson
4 days: 10–13	Classifying Organisms <i>Classify organisms based on their shared characteristics.</i>	Course Activity
4 days: 14–17	Embryology <i>Explain why similarities in embryos of different species provide evidence of evolution.</i>	Lesson
4 days: 18–21	Comparative Anatomy <i>Examine anatomical similarities between organisms and explain why these similarities provide evidence of evolution.</i>	Lesson
4 days: 22–25	Fossils <i>Analyze data from rock strata for evidence that life-forms have changed and evolved.</i>	Lesson
5 days: 26–30	Unit Activity and Discussion—Unit 1	Unit Activity/ Discussion
1 day: 31	Posttest—Unit 1	Assessment

Unit 2: Energy Flow in Ecosystems

Summary

This unit provides an understanding of energy flow in ecosystems. First, you'll compare your diet with a recommended diet. You'll then learn about the process of photosynthesis in plants. Then you'll develop a model to exhibit the process of digestion in various organisms. You'll inspect the process of yeast fermentation and its benefits to humans. Finally, you'll learn about the interdependence of ecosystems and develop a model to explain the flow of energy in an ecosystem.

Day	Activity/Objective	Type
4 days: 32–35	Human Nutrition <i>Monitor your food intake and draw conclusions about your diet compared to the recommendations for people your age.</i>	Course Activity
4 days: 36–39	Photosynthesis <i>Explain the role of photosynthesis in the cycling of matter and flow of energy.</i>	Lesson
3 days: 40–42	Nutrition and Digestion <i>Develop a model that shows how organisms use food to create energy for growth and development.</i>	Lesson
4 days: 43–46	Yeast Fermentation <i>Plan an investigation that answers a scientific question about the growth needs of yeast.</i>	Course Activity
3 days: 47–49	What Is an Ecosystem? <i>Construct an explanation that relates the influence of environment and genes on the growth of organisms.</i>	Lesson
3 days: 50–52	Food Webs <i>Develop a model of a food web that explains how energy cycles through the organisms in the ecosystem.</i>	Lesson
5 days: 53–57	Unit Activity and Discussion—Unit 2	Unit Activity/ Discussion
1 day: 58	Posttest—Unit 2	Assessment

Unit 3: The Interdependence of Ecosystems

Summary

This unit focuses on interdependence in ecosystems. At the start of the unit, you'll observe a plant grown in a sealed bottle and explain the effect of interdependence on the plant's growth. You'll describe the different types of relationships that exist in an ecosystem. You'll discover the types of resources that an organism needs for survival, and you'll determine the cause-and-effect relationship that this need has on the availability of resources. Next you'll explore the effects that humans and other environmental factors have had on the populations of organisms in an ecosystem and research the effects of humans on the ocean ecosystem. Finally, you'll describe various measures that need to be taken to protect the biodiversity of ecosystems.

Day	Activity/Objective	Type
7 days: 59–65	Build a Pop-Bottle Biome <i>Define the criteria and constraints of a design problem and build a pop-bottle biome.</i>	Course Activity
3 days: 66–68	Relationships in an Ecosystem <i>Identify competitive, predatory, and mutually dependent relationships between organisms in various ecosystems.</i>	Lesson
3 days: 69–71	Resource Availability <i>Analyze the cause-and-effect relationships between the availability of resources and the growth of organisms in an ecosystem.</i>	Lesson
3 days: 72–74	Biodiversity and Population Size <i>Use evidence to argue that changes to physical or biological components of an ecosystem affect populations of organisms.</i>	Lesson
4 days: 75–78	Human Effects on Ocean Ecosystems <i>Research one effect that humans have on the ocean's ecosystem.</i>	Course Activity
4 days: 79–82	Protecting Ecosystems <i>Evaluate solutions to maintain biodiversity in an ecosystem.</i>	Lesson
5 days: 83–87	Unit Activity and Discussion—Unit 3	Unit Activity/ Discussion

1 day: 88	Posttest—Unit 3	Assessment
1 day: 89	Semester Review	
1 day: 90	End-of-Semester Exam	Assessment

Appendix A: Safety Notes and Disclaimer

Each Course Activity and Unit Activity that includes a lab/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 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/lab component.
- Do not perform experiments that have not been approved. Follow the procedure.
- 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.

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Appendix B: Equipment List for Course Activities and Unit Activities

Unit	Activity Name	Task	Equipment List
1	Course Activity: Fossils and Coal Formation	Modeling Fossil Formation	<ul style="list-style-type: none"> • a plastic container about the size and shape of a shoebox • plastic wrap • water • a ruler • about 3 cups of sand • plastic gloves (kitchen gloves or cleaning gloves) • 10 to 12 leaves (any kind) • 10 to 12 twigs and sticks
1	Course Activity: Classifying Organisms	Task 1: Creating a Dichotomous Key	None
		Task 2: Classifying Organisms	None
1	Unit Activity: Evolution	Researching Evolutionary History	None
2	Course Activity: Human Nutrition	Tracking and Analyzing Your Food Intake	<ul style="list-style-type: none"> • a notebook (preferably a pocket-sized notebook that is easy to carry around) • kitchen measuring cups (1/4 cup, 1/2 cup, 1/3 cup, and 1 cup), optional • kitchen measuring spoons (1/2 teaspoon, 1 teaspoon, and 1 tablespoon), optional
2	Course Activity: Yeast Fermentation	Task 1: Factors That Cause Fermentation	<ul style="list-style-type: none"> • 6 latex balloons (Use balloons of any shape, but make sure they are all the same.) • 2 cups hot tap water • 2 cups cold (refrigerated) water • 2 cups lukewarm tap water • 6 24-ounce plastic bottles • 6 (0.25 ounce) packets active dry yeast • ½ cup sugar • measuring spoon

Unit	Activity Name	Task	Equipment List
		Task 2: Planning a Yeast Investigation	None
2	Unit Activity: Energy Flow in Ecosystems	Task 1: Developing a Model of an Oil Spill	<ul style="list-style-type: none"> • 3 cups dry sand • 8-inch x 8-inch disposable or metal baking pan (larger or rectangular pans can be substituted, but you'll need to adjust the amounts of water and sand) • about 4 cups room temperature water • ruler • ¼ cup vegetable oil • dark-colored food coloring (optional, for making the oil darker so that it's easier to see) • 2 quill-type bird feathers (white or other natural colors, undyed) • 1 cup hot water • 1 cup cold water • spatula
		Task 2: Designing Solutions for an Oil Spill	<ul style="list-style-type: none"> • 3 small bowls • about 3 cups room temperature water • 6 tablespoons vegetable oil • food coloring (for the oil, optional) • materials of your choice
3	Course Activity: Build a Pop-Bottle Biome	Task 1: Building a Pop-Bottle Biome	<ul style="list-style-type: none"> • 1 two-liter pop bottle, with the label removed • 1 cup of dirt or potting soil • 1 or 2 small green plants (no cactuses) that grow in wet to moderately wet environments with direct sunlight • scissors or knife • a small thermometer that fits inside the bottle • tape (optional)

Unit	Activity Name	Task	Equipment List
		Task 2: Designing a Desert Biome	<ul style="list-style-type: none"> • 1 two-liter pop bottle, with the label removed, or other container • 1 or 2 small cacti of your choice that will fit in the container • a small thermometer that fits inside the container • planting materials of your choice • a pair of thick work gloves (to handle the cactus)
3	Course Activity: Human Effects on Ocean Ecosystems	Writing a Research Paper	None
3	Unit Activity: The Interdependence of Ecosystems	Evaluating Solutions	None