

Biology

This course helps students build success in science. The text is friendly and accessible, with abundant photos and technical illustrations. The 50 labs included in the course develop a range of important science skills in data collection, modeling and exploration. The following books are required for this course:

- The Oak Meadow Biology Syllabus
- Holt *Biology*, by George Johnson & Peter Raven; Holt, Rhinehart, and Winston Publishers, 2005

Outline of the Biology Syllabus:

Lesson 1: Biology and Chemistry Chapter 1 Lab: Determining the pH of Common Substances Chapter 2 Lab: Analyzing the Effect of pH on Enzyme Activity	Lesson 6: DNA Chapter 9 Lab: Modeling DNA Structure
Lesson 2: Cells Chapter 3 Lab: Calculating Surface Area and Volume	Lesson 7: Proteins Chapter 10 Lab: Modeling Protein Synthesis
Lesson 3: Energy Chapter 5 Concept Map	Lesson 8: Gene Technology Chapter 11 Lab: Modeling Gel Electrophoresis
Lesson 4: Cell Division Chapter 6 Lab: Calculating the Number of Cells Resulting from Mitosis Chapter 7 Lab: Modeling Meiosis Crossword Puzzle: Meiosis and Sexual Reproduction	Lesson 9: Life and Evolution Chapter 12 Lab: Analyzing Signs of Endosymbiosis Chapter 13 Lab: Comparing Limb Structure and Function
Lesson 5: Heredity Chapter 8 Lab: Interpreting Information in a Pedigree Chapter 8 Lab: Identifying Dominant or Recessive Traits	Lesson 10: Taxonomy Chapter 14 Lab: Analyzing Taxonomy of Mythical Organisms Chapter 14 Lab: Making a Cladogram
	Chapter 8 Lab: Evaluating a Pedigree

- Lesson 11:** Populations
Chapter 15 Lab: Using Random Sampling
- Lesson 12:** Ecosystems
Chapter 16 Lab: Modeling Succession
- Lesson 13:** Biological Communities
Chapter 17 Lab: Predicting How Predation Would Affect a Plant Species
Chapter 17 Lab: Predicting Changes in a Realized Niche
- Lesson 14:** The Environment
- Lesson 15:** Kingdoms of Life
Chapter 19 Concept Map
- Lesson 16:** Bacteria & Viruses
Chapter 20 Lab: Make Your Own Yogurt
Chapter 21 Lab: Interpreting Competition Among Protists
- Lesson 17:** Fungi
Chapter 22 Lab: Analyzing the Effect of Mycorrhizae
- Lesson 18:** The Plant Kingdom
Chapter 23 Lab: Distinguishing Fruits and Vegetables
- Lesson 19:** Plant Reproduction
Chapter 24 Lab: Observing the Arrangement of Parts of a Flower
- Lesson 20:** Plant Structures
Chapter 25 Lab: Observing Stems
Chapter 25 Lab: Inferring the Rate of Transpiration
Chapter 26 Lab: Investigating the Effects of Ethylene on a Plant
- Lesson 21:** The Animal Kingdom
Chapter 27 Lab: Calculating Filtration Rate in the Human Kidney
Chapter 27 Crossword Puzzle
- Lesson 22:** Simple Invertebrates
Chapter 28 Lab: Identifying Parasites
- Lesson 23:** Mollusks & Annelids
Chapter 29 Lab: Modeling an Open Circulatory System
Chapter 29 Lab: Modeling a Closed Circulatory System
- Lesson 24:** Higher Invertebrates
Chapter 30 Lab: Analyzing the Effects of Pesticide Use
Chapter 31 Lab: Determining How Predators Affect Prey
- Lesson 25:** Vertebrates
Chapter 32 Lab: Using Timelines and Phylogenetic Trees
- Lesson 26:** Fishes & Amphibians
Chapter 33 Lab: Modeling the Action of a Swim Bladder
Chapter 33 Crossword Puzzle
- Lesson 27:** Reptiles and Birds
Chapter 34 Lab: Calculating Average Bone Density
- Lesson 28:** Mammals
Chapter 35 Lab: Comparing Gestation Periods
- Lesson 29:** Animal Behavior
Chapter 36 Lab: Observing Behavior in Animals
Chapter 36 Lab: Studying Nonverbal Communication
- Lesson 30:** The Human Body
Chapter 37 Lab: Comparing Skeletal Joints
Chapter 37 Lab: Analyzing the Work of Muscles
- Lesson 31:** Circulation & Respiration
- Lesson 32:** Food & Digestion
Chapter 39 Lab: Modeling the Function of Bile

- Lesson 33:** The Immune System
Chapter 40 Lab: Tracking
the Spread of AIDS
Chapter 40 Concept Map
- Lesson 34:** The Nervous System
Chapter 41 Lab:
Investigating Vision
- Lesson 35:** The Endocrine System
Chapter 42 Lab: Analyzing
Blood Glucose Regulation
- Lesson 36:** Reproduction
Chapter 43 Lab: Analyzing
Hormone Secretions

Lesson 12: Ecosystems

As you read this chapter on ecosystems, understand that we are a species that is part of the ecosystem in which we live, yet we tend to disrupt things a bit. Energy flows through and materials cycle through natural ecosystems in a way that tends to be balanced and sustainable. This lesson will introduce you to what makes up an ecosystem and how ecosystems function.

Reading

- Read Chapter 16, *Ecosystems*, on pages 339-354.

You choose! After completing the assignments below, please complete either the lab or the research assignment listed below. For extra credit, do both.

Lab

- For Chapter 16, complete the quick lab *Modeling Succession*. For this lab, a good way to incubate the milk is to put the jar in a small picnic cooler with warm water in it, and change the water twice a day.

Research

Using the information on page 354 as a starting point, do some research on an aspect of sustainable agriculture. Begin your one to two page paper with a paragraph that defines what sustainable agriculture is, and what the benefits are for the future. Explain some of the benefits to soil, water, and the ecosystem in general. Include some examples of farming techniques that are used. If you have any personal experience with sustainable agriculture, you can share them. In your concluding paragraph, explain how this important issue relates to the subject of this lesson (energy flow and nutrient cycles). Be sure to include a bibliography.

Assignments

1. Identify what components of an ecosystem are *not* part of a community.
2. How does gardening or agriculture affect succession?

3. Differentiate primary succession from secondary succession.
4. Explain how producers differ from consumers.
5. Draw a food web different from the one in the text, and explain the interactions of the organisms that comprise it.
6. Analyze the flow of energy through a food chain that contains four trophic levels. Explain why food chains usually don't exceed four links, and what happens to the energy as it moves up the trophic levels.
7. How much energy is available at the third trophic level of an energy pyramid if 1,000 kcal is available at the first level?
8. Identify the role of energy in the part of the water cycle in which plants transfer water to the atmosphere.
9. Explain how the flow of energy contributes to and overlaps with the steps of the carbon cycle.
10. Describe how bacteria participate in the nitrogen cycle. (Hint: There is more than one way.)
11. Defend the argument that nutrients can cycle but energy cannot. (Hint: Use the information from your answers to #6 and #8 to help you answer this question.)
12. What might happen to an ecosystem if all the decomposers were to die?

Chapter 16 Lab: Modeling Succession

You can create a small ecosystem and measure how organisms modify their environment.

MATERIALS

- 1 qt glass jar with a lid
- one-half quart of pasteurized milk
- pH strips

Procedure

1. You will be using the data table below to record your data.

Data Table		
Day	pH	Appearance
1		
2		
3		
4		
5		
6		
7		

2. Half fill a quart jar with pasteurized milk, and cover the jar loosely with a lid. Measure and record the pH. Place the jar in a 37°C incubator.
3. Check and record the pH of the milk with pH strips every day for seven days. As milk spoils, its pH changes. Different populations of microorganisms become established, alter substances in the milk, and then die off when conditions no longer favor their survival.
4. Record any visible changes in the milk each day.

Modeling Succession *continued*

Analysis

1. Identify what happened to the pH of the milk as time passed.

2. Infer what the change in pH means about the populations of microorganisms in the milk.

3. Critical Thinking

Evaluating Results How does this model confirm the model of succession in Glacier Bay?
