Animals

OVERVIEW

In *Animals*, students learn classification systems and the place of animals (including humans) within them. They explore physical and lifestyle characteristics of invertebrates and vertebrates through hands-on activities. They compare organisms in terms of adaptations such as symmetry, movement, and organ systems. They explore the transition to land and temperature regulation. They are introduced to concepts of evolution and the fossil record.

STUDENT OBJECTIVES

- Review the current three-domain, six-kingdom classification system.
- Design and use a dichotomous key to classify organisms.
- Explore the characteristics of eight invertebrate phyla.
- Compare body symmetry, movement, and organ systems in various animals.
- Learn the major characteristics of chordates and vertebrates.
- Compare the characteristics of the five classes of vertebrates.
- Consider some causes and effects of variation in the animal kingdom.
- Relate structural and behavioral adaptations to natural selection and evolution.
- Complete a fossil activity to illustrate the history of animal life on Earth.

ACTIVITIES

Students complete three performance assessments: 1) Classifying Invertebrates – identify invertebrate specimens to phylum and point out characteristics, including symmetry; 2) Vertebrates – list vertebrate adaptations for land, reproduction, and parental care and identify vertebrates by class; and 3) Adaptation and Evolution – explain genetic changes that occur during natural selection, show and explain layering of fossils, distinguish between relative and absolute fossil age, and explain half-life.

Climate & Biomes

OVERVIEW

In *Climate & Biomes*, students learn what climate is, what processes drive it, and how we measure both past and present climates. They locate and describe Earth's major biomes (large ecological systems), relate biomes to climatic zones, and demonstrate concepts such as the greenhouse effect, albedo, and global warming. This title enables students to practice higher level scientific thinking, such as use of models, recognizing types of evidence, and developing informed opinions.

STUDENT OBJECTIVES

- Learn major factors controlling world climate.
- Relate climatic patterns to Earth's biomes or vegetation patterns.
- Compare past and present climatic cycles.
- Learn how scientists determine past climates and predict future climates.
- Manipulate a simple model of climatic changes.
- Understand and demonstrate the greenhouse effect and global warming.
- Distinguish among fact, opinion, and scientific theory.
- Learn how to find and evaluate scientific evidence.
- Develop and write an informed opinion on the human contribution to global warming.

ACTIVITIES

Students complete three performance assessments: 1) Dendrochronology – analyze past climates through tree-ring analysis; 2) Greenhouse Effect – illustrate and explain the greenhouse effect using a tabletop experimental system and distinguish four different types of evidence; and 3) Global Warming Controversy – explain the construction and use of a climate model; compare biased and unbiased sources; research, write, and justify an informed opinion on global warming.

Future Fuels

OVERVIEW

In *Future Fuels*, students determine how the Sun is the source for all energy we use on Earth. *Future Fuels* explores the need to find replacements for fossil fuels. Students investigate the concepts of renewable and nonrenewable resources and how these types of resources affect the environment. They will explore and compare several alternative energies including wind, geothermal, and hydropower.

STUDENT OBJECTIVES

- Identify the Sun as the source of all energy on Earth.
- Compare and contrast renewable and nonrenewable energy sources.
- Relate the use of fossil fuels to environmental problems.
- Explore the history of human energy use.
- Compare different types of available future fuels.
- Identify several possible solutions that can work together to solve energy problems.

This title content focuses on green education.

ACTIVITIES

Students complete three performance assessments: 1) The Sun – explain how energy from the Sun is responsible for human energy and diagram how the Sun's energy moves a gasoline-powered car; 2) Renewable and Nonrenewable Energy – define the terms *renewable* and *nonrenewable* and give examples of these types of energy; and 3) Energy Solutions – contrast and compare two types of potential energy sources.

Going Green

OVERVIEW

In *Going Green*, students examine the environmental impact of personal choices made regarding the use of common household items. Students identify advantages and disadvantages of buying green and identify potentially toxic compounds found in many household products. Students will examine the amount of energy required to run common household appliances.

STUDENT OBJECTIVES

- Define terms relating to global warming.
- Describe the greenhouse effect.
- Identify renewable and nonrenewable sources of energy.
- Examine the energy efficiency of common kitchen appliances.
- Define *water efficiency*.
- Build a solar water heater.
- Examine environmentally friendly choices for each room of your house.
- Examine the importance of maintaining a home's heating and cooling systems.
- Define *carbon footprint*.

This title content focuses on green education.

ACTIVITIES

Students complete three performance assessments: 1) Greenhouse Effect – explain in their own words the greenhouse effect, define *energy*, and list three traditional energy sources and three alternate energy sources; 2) Wattage Comparison – identify fuels used by power plants; define *kilowatt-hour, power consumption*, and *phantom load*; and explain the results of the experiment; and 3) Solar Water Heater – list advantages of using a solar water heater, give examples of ways to cut a heating and cooling bill, and build a solar water heater.

Heat & Energy

OVERVIEW

In *Heat & Energy*, students learn definitions of concepts related to heat and energy, including temperature, potential and kinetic energy, and work. They look at heat and energy from the molecular viewpoint as they construct models of simple hydrocarbon fuels. Students learn the chemical reaction involved in combustion and the components necessary for combustion to occur, and they distinguish examples of exothermic and endothermic reactions.

STUDENT OBJECTIVES

- Describe how heat and light energy are capable of work.
- Express how molecular motion relates to temperature.
- Define and give examples of the first and second laws of thermodynamics.
- Classify different types of fuel sources.
- Contrast exothermic and endothermic reactions.
- Deduce that food is fuel.
- Conduct an experiment to evaluate the expansion properties of different materials.

ACTIVITIES

Students complete three performance assessments: 1) Hydrocarbon Molecules – build a methane molecule and a propane molecule and show a chemical bond and explain what it represents; 2) Heat Content – understand and explain the differences and similarities between specific heat, heat capacity, and heat content; and 3) Heat Expansion – study and explain heat expansion and use a compound bar to explain how a thermostat works.

Horticulture

OVERVIEW

In *Horticulture*, students briefly explore important subfields of horticulture and then delve into the processes of growing and maintaining their own plants, including germinating plants, making cuttings, and growing plants in both soil and hydroponics media. They explore plant classification, structure, and reproduction. They are introduced to the forestry industry, tree identification, and ecology and conservation concerns in horticulture and forestry.

STUDENT OBJECTIVES

- Conduct a plant germination experiment.
- Learn and experiment with plant growth requirements.
- Learn major plant groups and identify vascular plant structures.
- Dissect a flower and identify its reproductive structures.
- Learn and practice methods of asexual plant propagation.
- Explore the extent of the United States forest industry.
- Use a dichotomous key to identify forest trees by leaf type.
- Consider ecology and conservation concerns in horticulture and forestry.

ACTIVITIES

Students complete three performance assessments: 1) Plant Requirements – explain and demonstrate experiments showing plant growth requirements, including nutrients, water, and type of growth medium; 2) Plant Propagation – make and grow a plant cutting and propagate a potato from an eye; and 3) Forestry – differentiate between hardwood and softwood trees and identify tree leaves using a dichotomous key.

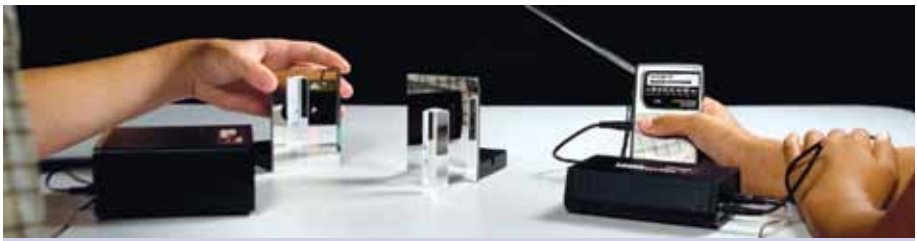
Light & Lasers

OVERVIEW

In *Light & Lasers*, students explore aspects of light and lasers and see how that technology can be used. Students use geometric concepts to divide and reflect a laser beam along a path and to create a security system utilizing the beam. Light is explored and manipulated through experiments that use lenses, prisms, filters, and intensity meters. The data from these experiments is analyzed and interpreted to provide a clear picture of the nature of light.

STUDENT OBJECTIVES

- Divide and reflect laser beams in desired paths using geometric concepts.
- Gather, analyze, and interpret data from experiments about the properties of light.
- Use algebraic concepts to perform calculations based on experimental data.
- Explore various properties including reflection, color, and intensity of light.
- Explore refraction of light.
- Use geometric concepts to predict reflected paths.
- Examine the effects of a prism on white light and laser light.
- Determine the magnification levels of various lenses.
- Determine the effects of distance and color on intensity.



ACTIVITIES

Students complete three performance assessments: 1) Reflection – explain the relationship between the angle of incidence and the angle of reflection; 2) Magnification – describe the magnification properties of a convex lens and a concave lens; and 3) Intensity – explain what determines the color and intensity of light and explain why a color paddle decreases the intensity of the light passing through it.

Oceanography

OVERVIEW

In *Oceanography*, students locate oceans and explore the topography of the ocean floor. They do several experiments and activities to understand salinity, density, conductivity, and pressure changes in the oceans, and to explore the actions of waves and currents. They survey the organisms found in several ocean habitats, and consider the ways in which humans use and abuse the oceans. They do several types of mathematical calculations related to ocean properties.

STUDENT OBJECTIVES

- Locate Earth's major oceans and explore the topography of the ocean floor.
- Do an experiment to determine density and conductivity of water at different salinities.
- Use a pressure column to demonstrate how pressure changes with depth.
- Learn the characteristics and importance of estuaries and coral reefs.
- Use a tabletop ocean basin to demonstrate actions of waves and currents.
- Explore the influence of the Moon on tides.
- Discuss some ways in which human actions are harmful to ocean ecosystems.

ACTIVITIES

Students complete three performance assessments: 1) Salinity – explain how to mix sea water of a specific salinity; distinguish among distilled, brackish, and ocean water; 2) Nearshore Environments – explain the characteristics of nearshore environments (estuaries, coral reefs); explain what causes high and low tides; and 3) Pressure, Waves, and Currents – using the Pitsco Pressure Column, show how pressure changes along a water column and relate this to pressure changes in the oceans.

Plants & Pollination

OVERVIEW

In *Plants & Pollination*, students fit plants into the five-kingdom classification system and learn the importance of plants on Earth. They are introduced to the structure and function of plant cells and tissues. They learn the functions of roots, stems, and leaves; and cover plant processes including photosynthesis, respiration, and transpiration. They also look at plant pollination and reproduction, and the difference between monocots and dicots.

STUDENT OBJECTIVES

- Learn the five- and six-kingdom classification systems and place plants within them.
- Learn to use a microscope and observe prepared plant cells under the microscope.
- Prepare slides, observe living plant cells, and compare plant cells with animal cells.
- Germinate seeds and observe seed leaves of monocots and dicots.
- Learn the importance of plant pigments; extract pigments using chromatography.
- Using slides and models, identify structures of stems, roots, and leaves.
- Demonstrate the process of photosynthesis.
- Understand the importance of photosynthesis and the factors affecting it.
- Identify plant reproductive structures; learn how pollination occurs and its importance.

ACTIVITIES

Students complete three performance assessments: 1) Plant Structure – identify monocot and dicot seeds and identify plant organs and tissues; 2) Plant Reproduction – identify reproductive structures, explain purpose of fruits and seeds, and describe pollination; and 3) Photosynthesis – show and explain the setup for the photosynthesis experiment, explain the results, and give reactants and products of the photosynthesis equation.

Simple Machines

OVERVIEW

In *Simple Machines*, students explore how work, force, energy, and machines make moving objects easier through the use of the computer and hands-on activities. Students use variables and equations to describe the principles of simple machines. Students use the information they learn about simple machines to design a compound machine that moves an object.

STUDENT OBJECTIVES

- Explore how simple machines are used to convert small input force to large output force.
- Use the scientific method to determine the mechanical advantage of simple machines.
- Perform experiments.
- Design and create a compound machine that moves an object.
- Identify patterns and investigate relationships to determine mechanical advantage.

ACTIVITIES

Students complete three performance assessments: 1) Inclined Planes – calculate the length of an inclined plane and the mechanical advantage; 2) Levers – explain how levers make work easier; demonstrate and explain how to use a lever to lift a five-newton weight with less than five newtons of force; and 3) Compound Pulleys – explain the relationship between the mechanical advantage of a pulley system and the number of pulleys.

Sustainable Agriculture

OVERVIEW

In *Sustainable Agriculture*, students explore issues facing today's farmers and ranchers. Topics such as soil composition, the water cycle, animal care and the use of genetically engineered hormones, and farming technology are covered in the title. Students explore the concept of urban farming and how large cities are creating ways to grow their own food locally. Throughout the title, students grow plants in various types of soil and draw conclusions about what type of soil produces the best plant growth.

STUDENT OBJECTIVES

- Perform various tests on soil samples to determine which is most favorable for growing certain plants.
- Explore the pros and cons of traditional farming versus organic farming.
- Describe the benefits of compost and the nutrients it brings to soil.
- Investigate urban farming and its potential impact on large cities.
- Perform an experiment related to the greenhouse effect.
- Explore the technology involved in green farming.
- Explain the water cycle and identify water sources for farm irrigation.

This title content focuses on green education.

ACTIVITIES

Students complete three performance assessments: 1) Compost – identify soil nutrients, determine how composting replenishes these nutrients, and explain soil acidity levels and the pH scale; 2) Greenhouse – explain the concept of greenhouses and how they work and identify positive and negative aspects of the greenhouse effect; and 3) Irrigation – explain the stages of the water cycle, the concept of conservation, and methods used to control runoff.

Weather

OVERVIEW

Weather begins from a global perspective by explaining circulation and weather patterns and moves to local weather system investigation. Students see the relevance of this title daily as their local weather changes. They learn how their local weather is predicted or forecasted on the news and how global weather patterns can influence their everyday lives. They use a computerized weather station to monitor daily weather data such as temperature, pressure, and wind direction.

STUDENT OBJECTIVES

- Identify elements that comprise the atmosphere.
- Distinguish among various instruments and technologies used by meteorologists.
- Examine the relationship between the seasons and weather patterns.
- Examine global circulation patterns and recognize the effect of these events on weather.
- Identify weather events associated with warm, cool, stationary, and occluded fronts.
- Recognize the differences in high and low pressure areas.
- Gather, analyze, and interpret weather data for creating forecast predictions.

ACTIVITIES

Students complete three performance assessments: 1) Weather Measurement – learn names and functions of weather instruments and download weather data to the computer; 2) Light Intensity – demonstrate how light intensity changes as a function of light angle; and 3) Air Masses and Fronts – diagram and explain air mass movement within a front, construct a weather map, and explain the weather patterns on the map.