

## Science

## Kindergarten

### Purpose

Through experimentation and observation, Kindergarten students will distinguish between living and non living, learn about the human body and explore the characteristics and needs of animals and plants. They will learn about the seasons, investigate sound and light, and some properties of magnets and movement. They will learn about the earth and sky, natural resources, conservation, and recycling. The science program will develop in the Kindergarten students a sense of wonder and appreciation for God's gifts to us.

### Outcomes

#### Life Science

The students will

- identify living and non living things.
- identify animals and describe them by their coverings and how they move.
- identify food, air, and water as basic animal and plant needs.
- identify ways to care for pets.
- identify similarities and differences between adult and baby animals.
- describe the life cycle of a plant.
- identify roots, stems, and leaves as the main parts of most plants.

#### Physical Science

The students will

- describe and classify objects in terms of observable physical properties.
- compare the mass of objects to determine which is lighter and heavier.
- identify parts of toys and other objects.
- compare and contrast loud and soft sounds.
- classify objects as hot or cold.
- describe sources of light.
- explore ways that objects move and change directions.
- discover that objects can sink or float in water.
- describe how magnets interact with classroom objects.

## Earth Science

The students will

- identify and describe various features on the earth's surface.
- identify objects seen in the sky at various times.
- identify and describe various types of weather and how it affects people.
- identify, describe, and compare the four seasons.
- identify natural resources and describe ways they are used.
- describe ways to conserve energy, water, and other natural resources
- identify recycling as a way to save trees and reduce waste.

## Human Body

The students will

- identify the five senses.
- use their senses to make observations and talk about the sense organ associated with each sense.
- identify body parts and describe how these parts are used.
- describe ways people change through infancy, childhood, and adulthood.
- describe ways people are alike and different.
- identify exercises and foods that contribute to good health.
- identify ways to keep clean, including hand washing and tooth brushing.
- identify reasons to keep clean.

## Teaching Strategies

- Teacher presentations, videos and the text
- Art projects for the seasons and weather
- Hatching chick eggs
- Observe caterpillar transformation
- Plant seeds
- Make anatomy apron
- Experiments with water, sound and movement
- Egg journal
- Play "what is it?" Use the five senses to identify.
- Songs and poems
- Sequencing cards for plants and animals

## **Assessments**

- Participation in activities
- Participation in class discussion
- Completion of art projects

## **Resources**

- Children's literature and reference books
- Songs, tapes, videos, and poems
- Puppets and puzzles
- Incubator
- Butterfly house
- Hamden County Improvement League
- Earthsbirthday .com
- Textbook

Scott Foresman Science  
Scott Foresman, 2003

**Purpose**

First grade curriculum consists of the study of Life Science, Physical Science, Earth Science, and the Human Body. The children will gain knowledge about the world in which they live by exploring plants and animals and their habitats; exploring the physical world around them; developing an awareness of what the earth is made of, why the sun, moon and stars are important and how the weather affects us; developing a better awareness of their body, how the parts work, and how to stay healthy and safe. The process skills for science inquiry will be introduced and used during the year. The science curriculum displays a challenging academic environment where there are many opportunities to discuss a love of God and the world He created.

**Outcomes**

## Life Science

The students will

- name parts of plants.
- explore how plants grow and change by observing seeds and bulbs.
- understand how people use plants.
- explore animal characteristics.
- discover what animals need to live and grow.
- know how animals move and protect themselves.
- learn about plant and animal habitats.

## Physical Science

The students will

- learn the properties of matter and how it can change.
- distinguish solids, liquids, and gases.
- discover how heat changes matter.
- explore how sound travels.
- explore how shadows are made.
- investigate how magnets work.
- explore how simple machines do work.

## Earth Science

The students will

- learn about the land.
- understand that most of the Earth is covered with water.
- learn about soil and rocks.
- discover how people use land, air, and water.
- explore ways to protect the Earth's resources.
- learn about different kinds of weather.
- know the different characteristics of the seasons.
- discover the features of the sun, moon and stars.

## Human Body

The students will

- explore how to use senses to observe.
- learn how bodies grow and change.
- discover how to measure growth.
- learn ways to keep bodies healthy.
- understand ways to stay safe.

## Teaching Strategies

- Practice reading
- Hands on lab activities
- Reading non-fiction literature
- Teacher presentations and reading text
- Use of overhead projector
- Produce artwork related to topic
- Plant seeds/bulbs and observe their growth
- Small group participation

## Assessments

- Lab activities following a specific rubric
- Artwork related to a specific topic
- Ability to join classroom discussions
- Workbook pages that are activity oriented
- Graphic Organizers

## Resources

- Maps and globe
- Non-fiction books
- Songs and poems
- Scholastic News Magazine
- Textbook
  - Scott Foresman Science
  - Scott Foresman 2003

**Purpose**

Second grade students will be introduced to life science, physical science, earth science, and the human body. The students will learn about the many changes that occur in each of these sciences. The second grade students will learn about the world around us in a challenging, academic environment.

**Outcomes**

## Life Science

The students will

- learn about different plants, the plant parts, how it grows, and how people use plants.
- learn about different animals, where they live, what they eat, and how they protect themselves.
- study frogs and butterflies – how they grow and change.
- learn about plants and animals that lived long ago.
- know what fossils are
- learn how we know about different kinds of dinosaurs.

## Physical Science

The students will

- learn about matter.
- describe an object by property, color, shape, size, and weight.
- discover objects that sink and float..
- learn about solids, liquids, and gases and how it can be changed from one to another.
- discover making and changing sounds.
- explore sources of heat and light.
- discover how light moves and experiment with shadows.
- learn about the forces that make objects move.
- explore magnets, gravity and electricity.

## Earth Science

The students will

- learn about different types of land and water on earth.

- learn how rocks and soil are formed.
- learn about volcanoes and earthquakes.
- discover earth's resources and ways we can take care of those resources.
- compare seasons and different types of weather.
- experiment with temperature.
- learn about what causes day and night.
- study the phases of the moon..
- learn about the planets and objects in our solar system.

## Human Body

The students will

- learn the function of the brain, heart and lungs.
- experiment with bubble blowing.
- experiment with exercise.
- learn about foods to eat to stay healthy.
- learn how food becomes energy for the body as it is digested.
- learn important aspects of hygiene.

## Teaching Strategies

- Practice reading
- Lab activities
- Non-fiction literature
- Reading text
- art related to topic

## Assessments

- Lab activities
- Art work related to a specific topic
- Ability to join in classroom discussions
- Workbook pages
- Graphic organizers



## Resources

- Maps and globe
- Non-fiction books
- Songs and poems
- Scholastic Magazine
- Text

Scott Foresman Science  
Scott Foresman , 2003

**Purpose**

Third grade students will be introduced to life science, physical science, and earth science. Each student will gain knowledge about plants, animals, their environment, matter, force, machines, and work. The students will develop an understanding of God's world that they live in and how nature and people impact each other.

**Outcomes**

## Life Science

The students will

- learn how plants live and grow.
- learn how flowering plants and conifers grow from seed.
- explore the life cycles of spiders, insects, fish, amphibians, and mammals.
- find out how animal babies learn.
- explore where living things live.
- explore how animals and plants are adapted to their environment.
- explore how animals get food.
- learn how environments change.
- discover how people affect animals and plants.

## Earth Science

The students will

- learn how earthquakes, volcanoes, water, and living things change the earth's landforms.
- discover the characteristics of rocks and minerals.
- explore how soil is formed.
- investigate how the sun affects earth.
- investigate how the moon moves.
- discover how rain and snow form.
- learn where water can be found on the earth.
- find out how water moves in a water cycle.
- learn how thunderstorms form.
- learn what causes hurricanes.

- learn about tornadoes.
- learn about two types of winter storms.
- learn how to stay safe during storms.

## Physical Science

The students will

- learn how force makes an object move.
- discover how friction affects an object.
- learn how the force of gravity affects objects.
- learn about magnetism.
- discover simple machines and how they work.

## Teaching Strategies

- Reading and class discussion
- Teacher presentation
- Transparencies
- Make models and draw and label diagrams
- Diorama
- Investigation and observation activities and experiments in the lab
- Venn diagrams to compare and contrast
- Posters
- Videos

## Assessments

- Worksheets
- Class discussion
- Draw and label diagrams
- Models
- Diorama with oral presentation
- Rubrics
- Quizzes and tests

## Resources

- Children's Literature
- Scholastic News Magazine
- Cross-curricular areas of math, reading skills, social studies, or art
- Transparencies
- Videos
- Textbook
  - Scott Foresman Science
  - Scott Foresman, 2003

**Purpose**

Fourth grade students will learn about Life Science (plants, animals, ecosystems, survival of organisms), Physical Science (matter, force and motion, electricity and magnetism, light and sound), and Earth Science (weather, makeup of the earth, movements in the solar system). In a challenging environment they will gain further understanding of those topics by studying people in the fields of science and the information they've gathered through experimentation and observation.

**Outcomes**

## Life Science

The students will

- learn how plants are classified and the parts of a flowering plant.
- learn the characteristics of animals without backbones and animals with backbones.
- describe the living and nonliving parts of an ecosystem.
- discover how energy is transferred within an ecosystem.
- discover what adaptations and behaviors help animals and plants survive in a changing environment.
- enhance understanding of the concepts discussed through participation in laboratory experiences.
- explore how assorted bean seeds can be classified.
- investigate how flowers of different plants are similar and different.
- learn how bean plants grow by germinating and planting seeds.
- investigate characteristics used to classify some animals without backbones.
- explore how to make a woodland habitat model.
- investigate the decomposition of several objects.
- explore ways in which an insect's coloring or pattern might help it hide.

## Physical Science

The students will

- learn what matter is made of and how it can be measured.
- learn how work is defined and about the laws governing motion.
- investigate both electricity and magnetism and study how they affect matter.
- learn how light and sound travel and how the human body sees light and hears sound.

- enhance understanding of the concepts discussed through participation in laboratory experiences.
- explore some of the properties of liquids and solids.
- investigate how the properties of several types of matter can be measured and described.
- explore changes in motion.
- observe the effects of a chemical change.
- change potential energy to kinetic energy.
- build a closed circuit (parallel and series circuits).
- observe a magnetic field.
- investigate how to make an electromagnet and how electricity is related to magnetism.
- experiment to determine how the number of coils in an electromagnet affects its strengths.
- explore the effects of a prism on sunlight.
- investigate how well light passes through different materials.

## Earth Science

The students will

- discover how to measure and predict weather.
- identify landforms of the earth.
- describe how volcanoes, earthquakes, weathering, and erosion affect the earth's features.
- investigate the characteristics of the ocean.
- learn about plants and animals that live in aquatic environments.
- compare Earth with other planets of the solar system.
- enhance understanding of the concepts discussed through participation in laboratory experiences.
- explore how temperatures of light and dark surfaces compare with each other
- make a wind vane.
- investigate the physical properties of rocks and use the properties to classify rocks.

## Teaching Strategies

- Conducting teacher-led demonstrations and student-led activities related to topic matter
- Use of secondary sources such as literature and the internet for additional information
- Reading of the text, note-taking, newspapers/magazines, videos, class discussions
- Use of cross-curricular skills to further science concepts

## **Assessments**

- Ability to take part in classroom discussions of relevant topic matter
- Homework, lab sheets, lesson assessments, chapter tests, projects
- Participation in cooperative learning groups for activities

## **Resources**

- Secondary sources, reference books, videos
- Links to websites of relevant topics
- Transparencies, lab, instructional resources and, assessment manuals
- Textbooks

Science

Scott Foresman 2003

Discover Science

Scott Foresman 1989

**Purpose**

Fifth grade students will learn about Life Science (comparing living things, reproduction and change, adaptations, ecology), Physical Science (classifying matter, investigating motion, forms of energy, electrical energy), Earth Science (the changing earth, the earth's resources, climate, astronomy). In a challenging environment they will gain further understanding of those topics by studying people in the field of science and the information they've gathered through experimentation and observation.

**Outcomes**

## Life Science

The students will

- describe the life processes carried out by all living things.
- explain that living things are made of at least one cell and that cells work together to make tissues, organs, and organ systems.
- explain how scientists classify living things into five kingdoms.
- learn that scientific classification is an ongoing process.
- distinguish between invertebrates and the main groups of vertebrates.
- learn how plants are classified as mosses, ferns, conifers, and flowering plants.
- explain how cells divide and how individuals are formed by fission and cell fertilization
- discover that offspring inherit traits similar to those of their parents.
- explore the inheritance of both dominant and recessive traits.
- learn about Gregor Mendel's discovery of inherited traits and the discovery of genetic information on chromosomes.
- learn that adaptations are traits that help organisms meet their basic needs and survive in their environment.
- describe several adaptations for living in water and on land and relate how each helps an organism survive in its environment.
- learn about adaptations for cold climates, hot and dry climates, and seasonal changes.
- describe variations that occur among organisms of a species.
- list the basic parts of an ecosystem.
- compare and contrast habitats and niches as well as a population and a community.
- describe how a food chain and a food web show how energy flow among organisms.
- describe the roles of producers and consumers in an ecosystem.
- describe the flow of materials in the carbon dioxide-oxygen cycle, the nitrogen cycle, and the water cycle.



- enhance understanding of the concepts discussed through participation in laboratory experiences.
- explore the characteristics of life.
- investigate the growth of mold on food.
- explore the properties of cells.
- investigate the inheritance of genes and traits by making a model.
- conduct a survey to determine the frequency of inherited traits.
- explore the effects of protective coloring.
- investigate a model of fat insulation.
- experiment to find how light affects the ability of a plant to use carbon dioxide.

## Physical Science

The students will

- explain that elements are the building blocks of matter and learn the structure of an atom.
- explain what molecules and compounds are and give examples of how scientists use this knowledge to develop materials.
- describe the characteristics of a mixture and a solution.
- compare and contrast a physical property and a physical change.
- describe the differences between a chemical property and a chemical change.
- describe how to measure the speed at which an object moves and explain what velocity is.
- explain and give examples of inertia, the forces that affect motion, and an action and a reaction.
- define gravity and explain the effects of mass and distance on the strength of the gravitational pull between objects.
- define friction and explain its effects on motion.
- define and explain the differences between kinetic energy and potential energy.
- describe how energy is classified into various forms and ways that energy changes form when it is used.
- describe waves and the electromagnetic spectrum and list uses for gamma rays, X rays, radio waves, and visible light.
- explain how sound waves travel and list uses for sound energy.
- describe how the movement of electrons causes attraction and repulsion.
- explain how electrons flow in an electric current.
- list examples of circuits in the home, explain their uses, and describe how electrical force and electrical current are measured.
- explain how electricity and magnetism are related and describe how generators use magnets to produce electricity.
- enhance understanding of the concepts discussed through participation in laboratory experiences.
- investigate how electric current can split water into its elements.
- investigate how several materials combine, and look for evidence of a

chemical change (vinegar and baking soda, calcium chloride and water, cornstarch and water).

- explore ways to control and change the motion of a pendulum.
- investigate the relationship between mass, inertia, and gravity.
- investigate the relationship between potential and kinetic energy.
- investigate whether objects are electrical conductors or insulators.

## Earth Science

The students will

- learn to distinguish among the atmosphere, hydrosphere, and lithosphere.
- describe the earth's crust, mantle, and core.
- discover evidence that indicates that the continents have moved and describe the events caused by plate movement.
- explain how weathering, erosion, and deposition change the earth.
- describe the three main kinds of rocks and how they may change form.
- describe how fossils can indicate changes in the earth.
- define and give examples of renewable and nonrenewable resources.
- describe the ways water is used and why water is important, as well as how wastewater is treated, how water pollution can be reduced, and how water can be conserved.
- explain how land resources are used.
- describe the ways in which people can preserve the land.
- identify categories of air pollution and describe why clean air is important.
- describe the water cycle and explain the role of temperature in the cycle as water changes from one state to another.
- compare and contrast climate and weather and describe how the tilt of the earth causes seasons.
- learn how several factors affect the climate in different locations.
- explain how volcanoes and changes in the patterns of ocean currents can cause changes in weather patterns.
- learn what objects make up the solar system and how objects in the solar system affect Earth.
- compare the sun with other stars, list the properties of stars, and explain what constellations are.
- explore how telescopes collect and focus light and other sources of radiation and describe how telescopic images are recorded.
- enhance understanding of the concepts discussed through participation in laboratory experiences.
- investigate how pollution can spread into underground water.
- explore how water evaporates and condenses.
- investigate how a greenhouse traps heat.
- investigate how lenses are used to magnify objects.

## **Teaching Strategies**

- Conducting teacher-led demonstrations and student-led activities related to topic matter
- Use of secondary sources such as literature and the internet for additional information
- Reading of the text, note-taking, newspapers/magazines, class discussions, videos
- Use of cross-curricular skills to further science concepts

## **Assessments**

- Ability to take part in classroom discussions of relevant topic matter
- Completion of homework, lab sheets, lesson assessments, chapter tests, projects
- Participation in cooperative learning groups for activities

## **Resources**

- Secondary sources, reference books, videos, links to websites of relevant topics
- Transparencies, lab, instructional resources, and assessment manuals
- Textbooks
  - Science  
Scott Foresman 2003
  - Discover the Wonder  
Scott Foresman 1994

**Purpose**

Sixth Grade students will be introduced to cell and whole-organism processes and similar processes in the larger parameters of ecosystems. Properties of matter will be analyzed in general terms and applied to sound and light. Students will learn acceptance and appreciation of others by working in groups for laboratory experiments.

**Outcomes**

## Cells

The students will

- list the characteristics of living things.
- distinguish between sexual and asexual reproduction
- describe the processes involved in metabolism.
- identify the needs of living things.
- explain how the sun is the primary source of all living things.
- distinguish between organic and inorganic compounds.
- state the three basic concepts included in cell theory.
- discuss the processes of diffusion and osmosis.
- distinguish between passive and active transport.
- explain why cells cannot grow by increasing in size.
- describe the phases of cell division.
- distinguish between autotrophic and heterotrophic organisms.
- explain the process of photosynthesis.
- explain the process of respiration
- explain the relationship between photosynthesis and respiration.
- distinguish between aerobic and anaerobic respiration
- enhance understanding of the concepts discussed through participation in laboratory experiences:
  - a) observing the carbon compounds in sugar.
  - b) preparing microscope slides and observing plant and animal cells.
  - c) observing the process of osmosis of iodine solution through a plastic bag.

## Ecology- Earth's Living Resources

The students will

- define environment.
- relate ecology to the relationship of living things with their environment.
- distinguish between living and non-living things in an environment.
- compare ecosystems, communities, and populations.
- define habitat.
- distinguish among producers, consumers, and decomposers.
- describe food chains and food webs.
- trace the path of solar energy through a simple food chain that includes humans.
- relate feeding levels to the available amount of energy.
- describe how competition can serve as a limiting factor.
- describe how predation can have a positive impact on prey.
- distinguish among commensalism, mutualism, and parasitism.
- describe how organisms adapt to their environment.
- explain why balance is important in an ecosystem.
- describe how biological clocks affect organisms.
- compare diurnal and nocturnal organisms.
- discuss migrations as an example of an annual rhythm.
- describe the steps in the water cycle, oxygen-carbon dioxide cycle, nitrogen cycle.
- define ecological succession and describe its effect on an ecosystem.
- describe a climax community's place in ecological succession.
- identify methods of dispersal and barriers to dispersal.
- define *biome*.
- describe conditions found in six land and two water biomes.
- describe how plants and animals have adapted to conditions in various biomes.
- discuss the reasons for the extinction of organisms.
- explain why people should try to save endangered species.
- enhance understanding of the concepts discussed through participation in laboratory experiences:
  - a) create food chain.
  - b) create food web.
  - c) create nature notebook – log of natural changes in a given area through student-created sketches.
  - d) identify three major land biomes in country of choice.

## Matter

The students will

- describe matter in terms of general and specific properties.
- explain why mass of an object is constant while weight can change.
- discuss the relationship between mass and inertia.
- define gravity.

- compare weight and mass.
- define and measure volume in metric units.
- define density and compare densities of various objects.
- describe why an object floats or sinks in water using the concept of density.
- identify a physical change.
- describe four phases of matter.
- explain how adding or taking away energy will produce a phase change.
- discuss the relationship between heat, energy, and phase change.
- distinguish between physical and chemical properties of matter.
- distinguish between and chemical property and a chemical change.
- describe three important properties of a mixture.
- compare a heterogeneous mixture with a homogeneous mixture.
- explain what a solution is and discuss its properties.
- describe how a compound differs from an element.
- explain how a molecule is represented.
- explain why a chemical equation must be balanced
- explain the structure of the atom.
- explain the concepts of atomic mass, valence, and atomic number.
- describe the design of the modern periodic table.
- explain how properties of elements vary across a horizontal row, or period.
- compare the properties of metals, non-metals, and metalloids
- describe the properties of eight families of elements in the periodic table.
- explain how electron arrangement changes across a period.
- explain how atomic size changes across a period.
- enhance understanding of the concepts discussed through participation in laboratory experiences:
  - a) determine mass of regularly shaped objects.
  - b) determine mass of irregularly shaped objects.
  - c) determine mass of a liquid.
  - d) distinguish between chemical and physical changes that occur using salt and water, water and heat, heat and steel wool.

## Sound and Light

The students will

- explain what a wave is in terms of energy.
- define wavelength, frequency, and amplitude and relate them to each other.
- classify waves as transverse, longitudinal, or surface waves.
- distinguish between compressions and rarefactions.
- solve mathematical problems involving speed of waves.
- identify examples of each type of wave interaction: reflection, refraction, diffraction, interference.
- explain how waves are produced.

- describe how sound waves are transmitted.
- compare the phases of matter as to their ability to transmit sound.
- describe the properties of sound waves.
- explain how pitch and frequency are related.
- describe the Doppler Effect.
- compare the phase relationships required for constructive and destructive interference.
- describe the characteristics that combine to influence sound quality.
- relate the characteristics of music and noise.
- explain the process of sonar.
- identify the parts that make up the middle and inner ear.
- describe the nature of an electromagnetic wave.
- identify the parts of the electromagnetic spectrum.
- distinguish between luminous and illuminated objects.
- describe incandescent, fluorescent, and neon light.
- distinguish between the particle and wave properties of light
- explain the photoelectric effect.
- describe the ray model of light.
- compare regular and diffuse reflections.
- explain how concave and convex mirrors form an image
- explain how a prism refracts light to form a rainbow.
- explain how convex and concave lenses form an image.
- account for the color of opaque, translucent, and transparent objects.
- predict which colors will be transmitted, reflected, and/or absorbed by or from various substances.
- distinguish between colors of light and colors of pigments.
- describe polarized light.
- explain how vision occurs.
- describe nearsightedness and farsightedness.
- enhance understanding of the concepts discussed through participation in laboratory experiences:
  - a) create, identify, and observe the characteristics of longitudinal and transverse waves using a spring.
  - b) observe the characteristics of images created by convex and concave lenses.
  - c) observe the characteristics of images created using convex and concave mirrors.

## Human Biology

The students will

- describe four levels of organization in the human body.
- explain three functions of cells.
- describe four types of tissue.

- list the organ systems in the human body and describe the functions of their organs.
- describe three types of joints and the kinds of movement each allows.
- compare three types of muscle.
- explain how a sprain occurs.
- define *fracture* and explain how it heals.
- name the materials absorbed in the large and small intestine.
- trace the path of blood through the heart.
- list the four components of human blood.
- describe the different types of cardiovascular disease.
- explain why lungs are considered organs of both the respiratory and excretory systems.
- trace the path of urine from the kidney to the outside of the body.
- identify the structures of the neuron.
- list the structures and the functions of the peripheral nervous system.

### **Teaching Strategies**

- Use of transparencies in teacher presentations
- Note taking
- Videos
- Laboratory experiences
- The reading of topical scientific material in current magazine publications
- Cooperative learning in problem solving

### **Assessments**

- Written laboratory reports
- Critiques of published works
- Text tests
- Video reviews



## Resources

- Transparencies
- Magazines articles
- Public television videos
- Laboratory materials
- Textbook

Science  
Prentice Hall, 1994

**Purpose**

Seventh Grade students will compare the increasing complexities of organisms such as viruses, monerans, protists, fungi, plants, and animals. They will compare and contrast types of chemical bonds, types of electricity and the relationship between electricity and magnetism, which will lead to a study of the earth and the internal forces which cause Earth's features. Students will learn acceptance and appreciation of others by working in groups for laboratory experiences.

**Outcomes**

## Monerans, Protists, Fungi, and Plants

The students will

- describe Aristotle's early classification system of living things.
- explain how binomial nomenclature is used to classify living things.
- list in correct sequence the seven major classification groups.
- distinguish between multicellular and unicellular organisms.
- distinguish between organisms that are autotrophs and heterotrophs.
- list the characteristics of each kingdom in the five-kingdom classification system.
- list the life functions that viruses are capable of performing.
- describe the sequence of events in the reproduction of a bacteriophage.
- identify the major structures in a bacterium cell and how they obtain energy and reproduce.
- list several ways in which bacteria can be harmful or beneficial.
- describe general characteristics of plantlike, animal-like, and fungus-like protists.
- describe methods of movement and feeding used by animal-like protists.
- describe the food-absorbing and reproductive structures common to most fungi.
- describe reproduction in yeast.
- describe the structure and role of the organisms making up lichen.
- describe the characteristics of three algae phyla.
- explain how mosses, and liverworts and ferns have adapted to life on land.
- list the functions of roots, stems, and leaves.
- compare xylem and phloem vascular tissue.
- compare herbaceous and woody stems.
- describe the process of photosynthesis.
- identify the structures of a seed.
- describe the process of seed dispersal by angiosperms and gymnosperms.
- identify the characteristics of gymnosperms and angiosperms.

- identify the structures of a flower.
- explain the plant terms *annual*, *biennial*, and *perennial*.
- compare a positive tropism to a negative tropism.
- enhance understanding of the concepts discussed through participation in laboratory experiences:
  - a) classify students' shoes.
  - b) classify seeds.
  - c) create morphological model of virus.
  - d) observe paramecium, amoeba, and euglena.
  - e) observe moss.
  - f) observe and dissect a flower.

## Animals

The students will

- define *vertebrate* and give some examples.
- define *invertebrate* and give some examples.
- describe the physical appearance of a sponge and explain the methods by which sponges obtain food and oxygen.
- describe the characteristics of cnidarians.
- name three groups of worms and give examples of each.
- describe the characteristics of mollusks.
- name the major characteristics of arthropods.
- state the advantages and disadvantages of exoskeletons.
- identify characteristics of crustaceans, millipedes, centipedes, and arachnids.
- describe the distinguishing characteristics of insect.
- identify the stages of an insect's metamorphosis.
- detail the social structure of a bee colony.
- identify the distinguishing features of echinoderms.
- compare the differences between warm-blooded and cold-blooded vertebrates.
- name three groups of fish and their characteristics.
- identify the function of a swim bladder.
- describe reproduction by external fertilization.
- identify common characteristics of amphibians.
- describe the life cycle of a frog.
- describe several characteristics of reptiles.
- relate the structure and function of reptiles to their success in dry environments.
- identify the major characteristics of birds.
- describe the ways in which the form of birds shows adaptations for flight.
- describe the main characteristics of mammals.
- identify the major characteristics of marsupials and placental mammals.
- compare carnivorous and herbivorous placental mammals.

- enhance understanding of the concepts discussed through participation in laboratory experiences:
  - a) observe hydra.
  - b) observe and regenerate planaria.
  - c) observe a grasshopper.
  - d) observe a crayfish.
  - e) dissect a grass frog.

## Chemistry of Matter

The students will

- describe chemical bonding in terms of an atom's electron arrangement.
- define energy level.
- predict the resulting charge on an atom when electrons are added to or taken away from a specified atom.
- identify elements that have either low ionization energy or high electron affinity.
- describe the result of ionic bonding between elements as a regular pattern of ions in a crystal lattice.
- predict which atoms are most likely to engage in covalent bonding.
- construct an electron-dot diagram for a covalently bonded molecule.
- define metallic bond.
- describe the properties of metals.
- predict the common oxidation numbers of atoms based on the position of that atom on the periodic table.
- predict the formation of compounds between elements.
- describe the characteristics of chemical reactions.
- explain that a chemical reaction is accompanied by a change in properties and a change in energy of the substances involved in the reaction.
- define the terms *reactant* and *product*.
- discuss how chemical equations are used to describe chemical reactions.
- explain how a chemical equation illustrates the law of conservation of mass.
- balance chemical equations.
- distinguish between exothermic and endothermic reactions.
- define and discuss the term *activation energy*.
- relate the collision theory to factors affecting rates of chemical reactions.
- list four factors that affect the rate of a chemical reaction.
- define *solution* and name two components.
- compare electrolyte and nonelectrolyte solutions.
- compare saturates, unsaturated, and supersaturated solutions.
- describe three factors that influence the rate of solution
- state the properties of acids and bases.
- define and describe the use of indicators.
- explain the nature and the use the pH scale.
- describe salt formations in neutral reactions.

- enhance understanding of the concepts discussed through participation in laboratory experiences:
  - a) determine the rate of solution for sugar in water at various temperatures.
  - b) identify exothermic and endothermic reactions.
  - c) create a supersaturated solution.
  - d) identify acids and bases using an indicator.

## Electricity and Magnetism

The students will

- name three principal subatomic particles and state their charges.
- define and explain static electricity.
- compare friction, conduction, and induction.
- explain what causes lightning.
- define current electricity and state the unit in which it is measured.
- describe the structure and uses of wet cells, and dry cells.
- define voltage, state the unit in which it is expressed.
- define resistance and state the unit in which it is expressed.
- state and apply Ohm's Law.
- contrast direct and alternating current.
- define electric circuit.
- state the parts of an electric circuit and their functions.
- compare parallel and series circuits.
- explain the use and operation of fuses and circuit breakers.
- define electric power and state and apply the formula that relates it to voltage and current.
- state the units of power and electric energy.
- calculate electric energy, given power and time.
- define magnetism.
- describe the property of magnetic poles.
- explain the appearance and use of magnetic lines of force in relationship to magnetic fields.
- compare and contrast temporary and permanent magnets.
- explain the behavior of compasses.
- distinguish between geographic and magnetic poles.
- define electromagnetism.
- state the structure and function of electromagnets.
- describe the structure and use of electric motors.
- define electromagnetic induction.
- describe the structure, operation, and uses of a generator.
- explain the production of alternating current.

- enhance understanding of the concepts discussed through participation in laboratory experiences:
  - a) create static electricity and observe its effects using cereal.
  - b) create a series circuit and a parallel circuit.
  - c) create an electromagnet and alter its strength.

## Earth Science

The students will

- describe how stress can change the Earth's features, both on the surface and beneath the surface.
- explain three different types of stress.
- describe the different types of faults.
- describe an anticline and syncline.
- describe how a plateau is formed.
- describe the formation of a dome mountain.
- define isostasy.
- explain the cause of most earthquakes.
- compare the three major types of seismic waves.
- describe three different types of volcanoes.
- describe the theory of continental drift.
- explain how fossil evidence and rock evidence support the theory of continental drift
- describe ocean-floor spreading
- compare the three types of plate boundaries.
- enhance understanding of the concepts discussed through participation in laboratory experiences:
  - a) map the areas on the Earth where seismic activity has been recorded during a year and relate findings to map of lithospheric plates

## Teaching Strategies

- Use of transparencies in teacher presentations
- Note taking
- Videos
- Laboratory experiences
- The reading of topical scientific material in current magazine publications
- Cooperative learning in problem solving

## **Assessments**

- Written laboratory reports
- Critiques of published works
- Text tests
- Video reviews

## **Resources**

- Transparencies
- Magazine articles
- Public television videos
- Laboratory materials
- Textbook

Science  
Prentice Hall, 1994

**Purpose**

Eighth Grade students will be introduced to the complex role of DNA and RNA within the process of reproduction of organisms and their characteristics. The concepts will lead to a broader view of the theory of evolution. Students will explore the relationships between types of forces, and motion, including heat and its transfer. Students will gain an understanding of the forces that move our galaxy, create our stars including the Sun, and create the rocks, which compose our earth. Students will learn acceptance and appreciation of others by working in groups for laboratory experiences.

**Outcomes**

## Heredity

The students will

- define genetics.
- relate the work of Gregor Mendel to the development of the laws of genetics.
- explain the difference between self-pollination and cross-pollination.
- define dominant and recessive traits.
- describe the difference between a hybrid and purebred organism.
- explain the law of segregation.
- explain the law of independent assortment.
- describe incomplete dominance.
- describe a Punnett Square and explain its use.
- explain the difference between phenotype and genotype.
- explain the chromosome theory of heredity.
- describe the main function of chromosomes.
- list the steps of meiosis and what occurs in each step.
- explain the difference between mutation and mutagen.
- explain how a mutation can represent a beneficial or harmful change to an organism.
- name the primary components of a DNA molecule.
- explain the process of DNA replication.
- explain the role of RNA in protein synthesis.
- explain how human traits are inherited.
- identify the purpose of the sex chromosomes.
- discuss genetic mutations that can lead to genetic diseases.
- discuss how sex-linked traits are inherited.
- give an example of a sex-influenced trait.
- relate nondisjunction to certain human disorders.



- explain the purpose of amniocentesis.
- define selective breeding.
- explain the process of hybridization.
- discuss the advantages and disadvantages of inbreeding.
- define genetic engineering.
- describe how recombinant DNA is made.
- enhance understanding of the concepts discussed through participation in laboratory experiences:
  - a) predict the dominance and recessiveness of certain traits based on traits of classmates.
  - b) determine the probability of trait occurrence using mutant corn seeds.
  - c) create model of DNA replication and protein synthesis.

## Evolution

The students will

- learn how fossils provide evidence of Earth's past.
- identify six different types of fossils.
- discuss the law of superposition.
- discuss the significance of index fossils.
- explain how faults, intrusions, and extrusions provide clues to Earth's past.
- explain how radioactive dating is used to determine the ages of rocks and fossils.
- define evolution.
- explain how an adaptation can increase an organism's chance for survival.
- describe the chemical, anatomical, and fossil evidence for evolution.
- define natural selection.
- determine the effects of variation on natural selection.
- explain how natural selection leads to new and varied species.
- define migration and isolation and discuss its effect on evolution.
- explain the gradualism theory of natural selection.
- explain the punctuated equilibrium theory of natural selection.
- explain how scientists use fossils to trace the path of human evolution.
- describe the characteristics common to all primates.
- identify characteristics of different ancestors of humans.
- enhance understanding of the concepts discussed through participation in laboratory experiences:
  - a) examine different fossils and identify types of fossils.
  - b) mimic the effects of natural selection using a paper 'mouse' population.
  - c) compare thumb indexes and jaw indexes of a gorilla, Australopithecus, and human.
  - d) compare brain areas of skulls of five different primates.

## Motion, Forces, and Energy

The students will

- explain why all motion is relative.
- describe how motion occurs with respect to a particular frame of reference.
- identify frames of reference and the moving objects in different situations.
- define motion and speed.
- calculate speed.
- distinguish between constant speed and average speed.
- represent speed graphically.
- distinguish between speed and velocity.
- define and calculate acceleration and deceleration.
- interpret distance/time graphs for acceleration.
- describe circular motion.
- define and calculate momentum.
- explain the law of conservation of momentum.
- define force.
- explain how force is related to motion.
- define friction and how friction affects motion.
- identify three kinds of friction.
- explain the property of inertia.
- describe Newton's three laws of motion.
- relate force, mass, and acceleration.
- relate gravity and the motion of falling objects.
- explain the effects of air resistance on a falling object.
- state Newton's law of universal gravitation.
- describe pressure in terms of why it exists.
- compute pressure using  $P=F/A$ .
- explain the principles used in the operation of a hydraulic device
- explain buoyancy.
- describe how Archimedes' Principle explains why an object floats or sinks when placed in a liquid.
- define density.
- explain Bernoulli's Principle.
- calculate work using the formula  $W=F \times d$ .
- calculate power using the formula  $P=W \div t$ .
- define a machine.
- describe the relationship between force and distance as it relates to machines.
- explain what is meant by the efficiency and mechanical advantage of a machine.
- explain how each of the six simple machines works.
- explain the differences between the three types of levers.
- describe how fixed and movable pulleys work.
- explain how energy and work are related and why they are measured in the same units.

- list the five main forms of energy and give examples of each.
- state examples of objects with kinetic and potential energies.
- calculate the kinetic energy of a given mass at a given velocity.
- calculate the gravitational potential energy of a given weight at a given height.
- discuss energy conversions between states of energy and forms of energy.
- apply the law of conservation of energy to energy conversions within a process.
- relate energy to speed, momentum, force, power, and work.
- enhance understanding of the concepts discussed through participation in laboratory experiences:
  - a) measure student's speed (walking).
  - b) map marble movement to illustrate law of conservation of energy.
  - c) map marble movement to illustrate momentum.
  - d) diagram and measure mass movement using rolling carts to illustrate Newton's first law of motion.
  - e) diagram and measure balloon movement to illustrate Newton's third law of motion.
  - f) measure efficiency of the three classes of levers.
  - g) measure efficiency of fixed and movable pulleys.
  - h) describe energy conversions in pendulum movement.

## Heat

The students will

- describe how heat is caused by molecules moving.
- list the examples of heat-energy transfer by conduction, convection, and radiation.
- define temperature in terms of the kinetic energy of molecules.
- explain how a thermometer is used to measure temperature.
- explain the Kelvin and Celsius temperature scales.
- explain the difference between measurement of temperature and the amount of heat in a substance.
- calculate heat changes (in calories) using values for specific heat.
- explain how a transfer of energy brings about a phase change.
- explain how heat of fusion and heat of vaporization relate to phase changes.
- identify types of heating systems.
- explain how insulation prevents heat loss.
- explain the role of each basic component of a cooling system.
- describe how heat engines use heat energy to do work.
- describe some effects of thermal pollution.
- enhance understanding of the concepts discussed through participation in laboratory experiences:
  - a) measure heat loss/gain of differing amounts of hot/cold water when combined.

## Exploring the Universe

The students will

- describe the characteristics of a galaxy.
- identify the different kinds of star groups.
- describe the characteristics of novas, nebulae, and star clusters.
- describe how a spectroscope works.
- explain how star motion is detected by the Doppler effect.
- relate the big-bang theory to the concept of an open and closed universe.
- describe the size and brightness of stars
- explain how the composition of a star is determined.
- identify main-sequence stars using a Hertzsprung-Russell diagram.
- explain why stars shine.
- explain how star distance is measured.
- discuss the nuclear reactions that occur at the core of the sun.
- explain how stars are formed.
- describe the life cycles of medium-sized and massive stars and discuss current scientific ideas about black holes.
- relate the Earth's rotation and revolution to day and night and the seasons
- explain how the tilt of the Earth on its axis affects the seasons and the length of days and nights.
- describe the Earth's magnetosphere and the Van Allen radiation belts.
- relate the revolution of the moon to its various phases.
- define and describe solar and lunar eclipses.
- relate the gravitational pull of the sun and the moon to the tides of the Earth
- enhance understanding of the concepts discussed through participation in laboratory experiences:
  - a) observe the effects of parallax using a pin
  - b) use a spectroscope to observe the spectral lines created by different gases.
  - c) determine the different gases emitted by stars using spectral line graphs of actual stars.
  - d) create flip book illustrating the changing of the seasons on Earth.
  - e) create a flip book illustrating moon phases.

## Earth Science

The students will

- explain how minerals form.
- discuss the composition of minerals.
- identify minerals by their physical properties.
- define ore.
- relate the rock type to the way it was formed

- describe the rock cycle.
- explain how coarse-grained and fine-grained igneous rocks are formed.
- compare clastic, organic, and chemical sedimentary rocks.
- describe conditions under which metamorphic rocks form.
- compare chemical and mechanical weathering.
- identify three primary factors that influence the rate of weathering.
- describe soil formation.
- describe the composition of soil.
- explain what is meant by soil texture.
- identify and describe soil layers.
- discuss how erosion and deposition change the Earth's surface.
- explain how gravity contributes to erosion and deposition.
- explain how running water causes erosion.
- describe the development of a river system.
- discuss the difference between an immature river and a mature river
- enhance understanding of the concepts discussed through participation in laboratory experiences:
  - a) use Moh's Hardness Scale to rank items by hardness.
  - b) demonstrate particle movement caused by wind using different sizes of sand and gravel and a fan.
  - c) demonstrate erosion caused by runoff using soil with various amounts of vegetation.

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