Fifth Grade Science

Course Overview

Students perform experiments, develop scientific reasoning, and recognize science in the world around them. They build a model of a watershed, test how cell membranes function, track a hurricane, and analyze the effects gravity. Students will explore topics such as:

- **Water Resources—**water pollution; conservation; aquifers; watersheds; wetlands
- **The World's Oceans—**properties of ocean water; currents, waves, and tides; the ocean floor; marine organisms
- **Earth's Atmosphere—**layers; weather patterns, maps, and forecasts; fronts; El Niño; and the greenhouse effect
- **Forces of Motion—**types of pushes or pulls; position and speed; inertia; energy as a measure of work; gravity and motion
- **Chemistry—**structure of atoms; elements and compounds; the Periodic Table; chemical reactions; acids and bases
- **Cells and Cell Processes—**structure; membrane function; respiration and photosynthesis; growth cycles; genes and DNA
- **Taxonomy of Plants and Animals—**levels of classification; plants, animals, monerans, viruses, protists, and fungi
- **Animal Physiology—**circulatory, respiratory, digestive, excretory, and immune systems

Course Outline

Water Resources

- Identify the various sources of water, its uses, and different ways to conserve it
- Identify the typical steps that water-treatment plants go through to purify drinking water
- Describe how both natural processes and human activities affect water quality in watersheds
- Differentiate between *point source pollution* and *nonpoint source pollution*, and identify some ways by which they can both be reduced
- Identify and describe the different parts of a watershed
- Interpret a topographic map to identify the boundaries of a watershed
- Explain how a model of something differs from the real thing, but can be used to learn about the real thing
- Explain why wetlands are important to watersheds and how they can improve water quality

The World's Oceans

- Explain that water covers approximately three-quarters of the Earth's surface and that, since all the earth's oceans are connected, their water circulates through them all
- Define *salinity* and explain how the density of ocean water changes as salinity levels and temperature change
- Describe the movements of both the ocean's surface currents and its deep-water currents
- Explain how ocean waves form, identify their properties (such as height, length, crest, and trough), and describe their motions
- Explain how the combined gravitational pull of the sun and moon causes daily high and low tides
- Explain that the monthly cycle of spring and neap tides results when the earth, sun, and moon change their relative positions
- Describe characteristics of ocean habitats, and explain how various organisms are adapted to living in them
- Explain that the continental margin extends into the ocean and has three regions: the continental shelf, the continental slope, and the continental rise
- Describe some major features of the ocean floor, such as abyssal plains, trenches, ridges, seamounts, and reefs
- Identify some devices scientists use to study the ocean, including submersibles, sonar, and satellites
- Identify some ocean resources, such as fish, oil, and minerals, and describe how each one is obtained

Earth's Atmosphere

- Describe some properties of the atmosphere, such as its composition, density, and pressure, and explain how air density is related to both temperature and pressure
- Identify the five layers of the atmosphere: troposphere, stratosphere, mesosphere, thermosphere, and exosphere
- Explain that the uneven heating of the earth's surface transfers heat through convection currents in the atmosphere
- Define humidity as the amount of water vapor in the air, and the dew point as the temperature at which the air cannot hold any more water vapor
- Explain how clouds form, and identify common weather patterns associated with different types of clouds
- Identify types of precipitation (rain, snow, sleet, and hail) and explain how each type forms
- Identify some sources of air pollution
- Identify the three main types of storms and describe the air movements that produce them
- Identify the four types of fronts (cold, warm, stationary, and occluded) and describe how air masses interact
- Interpret weather maps to forecast the weather

- Distinguish between weather and climate, and describe some factors that influence climate (such as latitude, altitude, and ocean currents)
- Describe possible causes of climate changes (such as El Niño and the Greenhouse Effect) and their potential effects on climate

Motion and Forces

- Plot the movement of an object across a surface as separate horizontal and vertical movements
- State that moving objects always travel in one direction with constant speed unless a force—a push or a pull—is applied to them
- Describe the *mass* of an object as a measure of how difficult it is to change the object's speed or direction
- Identify different pushes and pulls (spring-driven, muscular, wind-driven, magnetic, or electric) as forces that can change an object's speed and direction
- State that every push or pull on one thing causes a balancing push or pull in the other direction on something else, and demonstrate in some actual situations in which these two sides of any given force are always present
- Identify the forces that are in balance when an object's speed and direction stay constant
- State that *energy* is a measure of how much work an object, or set of objects, can do
- State that the total amount of energy in a system always remains constant
- Recognize that moving objects have energy (kinetic energy), and that the position of an object may give it the ability to do work (potential energy)
- Describe how levers change the effects of pushes and pulls
- Recognize that for an object to continue moving in a circle, a force must pull the object toward the center of the circle, and predict that if the force disappears, the object will continue to move in a straight line
- Recognize that objects are pulled toward the earth by a force known as *gravity*
- Recognize that, regardless of the mass of a falling object, its speed toward the ground increases at the same rate as that of any other object
- State that any two masses have a gravitational pull between them, but this pull is easily noticeable only if at least one mass is very large
- Recognize that the pull decreases as the masses move farther apart, and increases as the size of either mass increases
- Recognize that gravity causes the moon to orbit the earth and the planets to orbit the sun
- Recognize that gravity is the primary force that shapes everything from clusters of stars to enormous galaxies
- Describe how our attempt to understand gravity has led to changes in our understanding of our solar system, our galaxy, and even our universe

Chemistry

- Explain that atoms are composed of a nucleus containing protons (with positive charge) and neutrons (with a neutral charge)
- Explain that negatively charged electrons move around the nucleus in paths called *shells*
- Describe a *compound* as a substance made of two or more elements
- Explain that the properties of a compound differ from the properties of the elements that make it up
- Recognize that each element is made of only one kind of atom
- Explain that all the elements are organized in the Periodic Table of the Elements according to their chemical properties
- Describe some properties of metals and nonmetals
- Identify some common elements and compounds by both their chemical symbols and their formulas
- Recognize that in chemical reactions, the original atoms rearrange themselves into new combinations, and that these new combinations have properties differing from those of the reacting compounds
- Write chemical equations to show what happens in a chemical reaction
- Use the pH scale to determine whether a solution is acidic or basic
- Recognize that compounds can be identified by chemical reactions
- Recognize that a wide variety of materials, and indeed living organisms, are often composed of just a few elements
- Explain that all chemical reactions require energy
- Describe how reaction rates increase with temperature, surface area, concentration, and the presence of a catalyst

Cells and Cell Processes

- Explain the major ideas of the cell theory
- Identify the major structures of cells, and describe their functions
- Compare plant and animal cells
- Explain that different types of substances move across the cell membrane by means of diffusion, osmosis, and carrier molecules
- Explain that plant cells store energy through photosynthesis, and that plant and animal cells release energy during respiration
- Explain that all cells have a cycle of growth, called

interphase, and a cycle of division, called *mitosis*
- Identify the four stages of mitosis: prophase, metaphase, anaphase, and telophase
- Explain that all the information an organism needs to live and reproduce is contained in its DNA
- Explain that traits are passed from parents to offspring and are determined by a pair of genes, one of which comes from each parent

Taxonomy of Plants and Animals

- Recognize that living things are classified according to shared characteristics, and that there are seven major levels of classification: kingdom, phylum, class, order, family, genus, and species
- Name the five kingdoms (plants, animals, monerans, protists, and fungi) and identify some organisms from each
- Describe *vascular plants* as plants that have systems for transporting water, sugar, and minerals, whereas *nonvascular* plants lack these structures
- Explain how sugar, water, and minerals are transported in vascular plants
- Compare the common characteristics, adaptations, and life cycles of gymnosperms and angiosperms

Animal Physiology

- Recognize that all body systems play a role in maintaining a constant internal environment
- Describe how the circulatory system transports oxygen and nutrients to cells while removing carbon dioxide and other wastes
- Recognize that many organisms have specialized structures for respiration, digestion, waste disposal, and immune response, and that these structures are responsible for the transportation of materials such as oxygen, carbon dioxide, and nutrients
- Explain how blood flows through the human heart
- Describe how the respiratory system exchanges carbon dioxide and oxygen in the lungs
- Put the various steps in digestion into correct order, describing the function of the mouth, esophagus, stomach, small intestine, large intestine, and liver
- Explain how the urinary system removes cellular waste from the blood, converts it to urine, and stores it in the bladder until the waste leaves the body
- Identify the types of organisms that can cause diseases and explain how they spread
- Describe ways in which the body's immune system recognizes and destroys pathogens

Lesson Time and Scheduling

Total lessons: 72
Lesson time: 60 minutes. You might choose to split the lessons into smaller segments and take breaks as needed. The K¹² online lesson tracking system allows you to pick up wherever you left off in any given lesson.

Standard Curriculum Items

Alum
Test tube
Safety goggles
Graduated cylinder
Spring scale
Thermometer

Additional Curriculum Items

Some lessons require additional resources, including common household items and books that are readily available online or in your local library:
Marble/small ball
Modeling clay
Potting soil
Coarse gravel
Pea gravel
Coarse sand
Fine sand
Plastic box
Tag board
How Bodies Work (Lickle Publishing)
Classifying Life (Lickle Publishing)

NOTE: List subject to change.