



## Science Shepherd Homeschool Life Science Curriculum

### Scope & Sequence

---

#### Chapter 1 – Introduction

##### **Goals**

- Define the focus of life science as a study.
- Discuss life science as a scientific pursuit that follows the scientific method.
- Define and discuss the scientific method.
- Define International Units (SI) and understand where they fit into scientific experimentation.
- Discuss the common methods of acquiring data during scientific experiments.

#### Chapter 2 – Characteristics of Life

##### **Goals**

- Investigate the meaning of “organism.”
- Define the properties that all living things share.
- Discuss the common things that almost all organisms on earth require to live.

#### Chapter 3 – The Chemistry of Life and Light Energy

##### **Goals**

- Investigate the concepts of matter, mass, and weight.
- Define the structure of atoms, elements, and molecules.
- Discuss the structure of the organic molecules: carbohydrates, proteins, lipids, and nucleic acids.
- Discuss the properties of the electromagnetic spectrum and visible light.

#### Chapter 4 – Cell Membrane: Passive and Active Transport

##### **Goals**

- Investigate the history and meaning of cell theory.
- Define the properties all cells have in common.
- Investigate the difference between the two basic cell types that make up all organisms—eukaryotic cells and prokaryotic cells.
- Describe the structure and function of the cell membrane.
- Understand the passive and active processes used to move substances across a membrane.

## Chapter 5 – Cell Interior: Structure and Function

### Goals

- Discuss the structure and function of the common eukaryotic organelles:
  - cytoplasm
  - nucleus
  - nucleoplasm
  - nucleolus
  - ribosome
  - endoplasmic reticulum
  - Golgi apparatus
  - lysosomes
  - mitochondria
  - vacuoles
  - chloroplasts
- Investigate the set of chemical reactions plants perform to make glucose. This process is called photosynthesis.
- Discuss the set of chemical reactions plants and animals use to make their energy molecules. This process is called cellular respiration.
- Discuss the relationship between photosynthesis and cellular respiration.

## Chapter 6 – DNA Structure and Function

### Goals

- Investigate how DNA is organized into the smaller units of chromosomes and genes.
- Define the properties of chromosomes and genes.
- Discuss the genetic code.
- Learn the pathway that is taken for a protein to be made from a gene.
- Discuss the biological process of DNA replication.
- Discuss the concept of mutations.

## Chapter 7 – Cell Reproduction

### Goals

- Investigate the biological process of cell division, both sexual and asexual.
- Define the asexual cell division processes of binary fission and budding.
- Examine mitosis in detail.
- Examine meiosis in detail.

## Chapter 8 – Heredity

### Goals

- Introduce and define new terms related to the study of heredity and genetics.
- Examine Gregor Mendel’s experiments in heredity as an example of both excellent science and ground-breaking results.
- Discuss the concept of dominant and recessive traits and the genes that code for them.
- Learn the use of Punnett squares.
- Discuss inheritance patterns.
- Review the process of mutation as it relates to causing genetic diseases.
- Discuss recessive and sex-linked genetic diseases.
- Learn the basics of genetic engineering.

## Chapter 9 – Evolution and Creation

### Goals

- Discuss the two most common beliefs about the origin of life—creation and evolution.
- Emphasize that both evolution and creation are faith-based beliefs regarding the emergence and existence of life.
- Explore the creation and evolution-endorsed process of natural selection.
- Investigate whether neo-Darwinism can properly explain how new types of organisms form.
- Investigate why creationists do not believe evolution adequately explains the existence of life and vice-versa.
- Discuss the process of fossil formation.
- Discuss the ways fossils and radiodating are interpreted by evolutionists and creationists.
- Investigate the possibility of transitional forms in the fossil record; specifically, Archaeopteryx.

## Chapter 10 – Scientific Classification I: Overview, Archaeobacteria, Eubacteria, and Viruses

### Goals

- Introduce the concepts of classifying all living organisms into the seven-level classification system.
- Define taxonomy and the six Kingdoms in the seven-level classification system.
- Define what a binomial name is.
- Learn the use of a dichotomous key.
- Investigate the properties of the organisms classified into Archaeobacteria and Eubacteria.
- Discuss the properties of the particles called viruses.

## Chapter 11 – Scientific Classification II: Protista and Fungi

### Goals

- Introduce the basic groups that make up Protista.
- Investigate the properties of the following protist groups:
  - plant-like protists or algae
  - animal-like protists or protozoa
  - fungus-like protists or slime molds
- Introduce the basic structure and functions of Fungi.
- Review the important history of Fungi as it relates to the discovery of antibiotics.
- Discuss the structure and function of mushrooms and molds.
- Define mycorrhizae and their importance to plants and fungi.
- Study the properties of lichens.

## Chapter 12 – Scientific Classification III: Plantae I

### Goals

- Investigate Plantae classification using a dichotomous key.
- Define and discuss the following plant traits:
  - vascular tissue
  - spore-producing or seed-producing
  - gymnosperm
  - angiosperm
  - monocot
  - dicot
- Discuss the characteristics and examples of:
  - nonvascular seedless plants
  - vascular seedless plants
  - gymnosperms
  - angiosperms
- Further divide the angiosperms into monocots and dicots.
- Investigate root, stem, and leaf structure and functions.

## Chapter 13 – Scientific Classification IV: Plantae II

### Goals

- Discuss methods of asexual plant reproduction.
- Discuss the two phases of the plant life cycle—the sporophyte and gametophyte phase.
- Discuss specific reproductive cycles for nonvascular plants, seedless vascular plants, gymnosperms, and angiosperms.
- Investigate flower structure and how it relates to angiosperm reproduction.
- Discuss the process of pollination, fertilization, and germination.
- Investigate the specific roles water has in maintaining plant life.
- Study nastic and tropic plant movements and how they occur.
- Identify the processes responsible for transporting materials in xylem.
- Discuss photoperiodism.

## Chapter 14 – Scientific Classification V: Kingdom Animalia I

### Goals

- Introduce technical terms related to the classification of animal species.
- Prepare a dichotomous key to classify all animal phyla discussed in this course.
- Discuss the features of the following phyla:
  - Porifera
  - Cnidaria
  - Platyhelminthes
  - Annelida
  - Mollusca
  - Arthropoda
  - Echinodermata

## Chapter 15 – Scientific Classification VI: Kingdom Animalia II

### Goals

- Discuss the features of the following Chordata classes:
  - Chondrichthyes, the cartilage fish
  - Osteichthyes, the boney fish
  - Amphibia, the amphibians
  - Reptilia, the reptiles
- Discuss the terms endothermic and ectothermic, then apply them to the chordate classes.
- Investigate the function of capillaries.
- Learn about one-loop and two-loop circulatory systems.

## Chapter 16 – Scientific Classification VII: Kingdom Animalia III

### Goals

- Discuss the features of Aves.
- Discuss the general features of mammals.
- Further categorize the mammals into placental mammals, marsupials, and monotremes.
- Further categorize the placental mammals into the following orders:
  - Rodents (Rodentia)
  - Insect-eating mammals (Insectivora)
  - Toothless mammals (Edentata)
  - Flying mammals (Chiroptera)
  - Hoofed mammals (Artiodactyla and Perissodactyla)
  - Trunk-nosed mammals (Proboscidea)
  - Carnivores (Carnivora)
  - Aquatic mammals (Cetacea and Sirenia)
  - Primates (monkeys, apes, and humans)

## Chapter 17 – Human Anatomy and Physiology: Control, Support, and Movement

### Goals

- Investigate the structure and function of the nervous system, with attention to:
  - the individual nerve cell (neuron)
  - motor neurons, sensory neurons, and interneurons
  - the central and peripheral nervous systems
  - the connection between the central nervous and peripheral nervous systems
  - reflexes
- Describe how our special senses of hearing, taste, and vision are structured and function.
- Describe the anatomy of the endocrine system.
- Discuss how the nervous and endocrine systems interact to chemically control the body.
- Learn how the endocrine system works by studying examples of the endocrine diseases diabetes and hypothyroidism.
- Study the structure and function of the integumentary system (skin).
- Discuss the structure and function of the three types of muscles—skeletal, cardiac, and smooth.
- Discuss how muscles attach to bones and move joints.
- Learn the structure and function of bone.
- Review the function of ligaments and tendons.
- Investigate joint types.

## Chapter 18 – Nutrition, Circulation, Respiration, and Protection

### Goals

- Discuss the components of the digestive system.
- Investigate the function of the digestive system with attention to:
  - mechanical digestion
  - chemical digestion
  - peristalsis
  - villi, microvilli, and absorption
- Discuss the components and function of the circulatory system.
- Review a two-loop circulatory system.
- Examine the internal heart anatomy with attention to the valves.
- Investigate how the heart beat and blood pressure are generated.
- Study the structure and function of blood.
- Discuss the components of the respiratory system.
- Learn the function of alveoli.
- Investigate how inhalation and exhalation occur.
- Discuss the components and function of the excretory system.
- Investigate how the kidney filters waste from blood and spares nutrients, ions, and water.
- Study the function of the immune system.
- Define pathogen.
- Discuss autoimmune diseases and organ transplantation as they relate to the immune system.

## Chapter 19 – Earth Studies

### Goals

- Introduce basic concepts and terms of ecology.
- Discuss the concepts of the biosphere.
- Investigate ecosystems with attention to:
  - abiotic mass
  - biotic mass
  - water, carbon, and oxygen cycles
  - pollution
  - energy transfer within predator-prey relationships
  - camouflage and mimicry
- Discuss marine and fresh water biomes.
- Discuss the seven terrestrial biomes.