EXPERIENCE BIOLOGY

Scope & Sequence

Experience Biology is an honors-level course investigating key subjects in foundational biology at the molecular, cellular, and microbiological level. Through coursework, hands-on labs, and research questions, students investigate foundational topics such as the scientific method, the chemistry of life, cytology, genetics, taxonomy, botany, zoology, human anatomy, and ecology. Emphasis is placed on developing critical thinking and scientific inquiry skills, preparing students for advanced study in the biological sciences.

Lesson 1: Introduction to Biology

- What is biology?
- Scientific investigation
- Limits of the scientific method
- Why is Earth well suited for life?
- Importance of water to life

Lesson 2: The Chemistry of LIfe

- Cells, molecules, elements, and atoms
- Ionic & covalent bonding
- Organic chemistry — the importance of carbon
- Carbohydrates, lipids, proteins, and nucleic acids

Lesson 3: Cytology

- Discovery of the cell
- Cell theory
- Cell structure
- Passive & active transport

Lesson 4: Cellular Metabolism Part I

- Heterotrophs & autotrophs
- Photosynthesis

Lesson 5: Cellular Metabolism Part II

- Cellular energy — ATP
- Cellular respiration
- Aerobic vs anaerobic pathways

Lesson 6: Cellular Metabolism Part III

- Basics of DNA
- Protein Synthesis: replication, transcription, and translation

Lesson 7: Life Cycle of the Cell

- Mitosis
- Meiosis

Lesson 8: Genetics Part I

- Mendelian genetics
- Law of segregation
- Law of independent assortment
- Incomplete dominance, codominance, multiple alleles
- Polygenic inheritance

Lesson 9: Genetics Part II

- Function vs structural genes
- Mutations & errors
- Variation
- Eugenics
- Biotechnology

Lesson 10: Exam 1

Lesson 11: Living Organisms

- Classification
- Binomial Nomenclature
- Overview of 6 Kingdoms

Lesson 12: Microbiology

- Kingdom Archaebacteria
- Kingdom Eubacteria
- Viruses

Lesson 13: Kingdom Protista

Protozoans — animal-like protists
Algae — plant-like protists
The “molds” — fungal-like protists

Lesson 14: Kingdom Fungi

Characteristics of fungus
Structure of fungi
Fungi reproduction
3 main groups of fungus

Lesson 15: Kingdom Plantae Part I

Characteristics of Plants
Overview of Phyla
Root and shoot system
Tissue types
Plant cells

Lesson 16: Kingdom Plantae Part II

Structure and function of leaves
Review of photosynthesis
Structure and function of stems
Structure and function of roots

Lesson 17: Kingdom Plantae Part III

Reproductive organs: flowers, fruits, and seeds
Vegetative vs sexual reproduction
Alternation of generations
Hormones
Tropisms
Photoperiodism
Importance of minerals

Lesson 18: Exam 2

Lesson 19: Kingdom Animalia

- Characteristics of of Kingdom Animalia
- Formation of germ layers
- Vertebrates vs invertebrates
- Endotherms vs ectotherms
- Phylum Porifera: the sponges

Lesson 20: The Worms

- Phylum Platyhelminthes: flatworms
- Phylum Nematoda: roundworms
- Phylum Annelida: segmented worms

Lesson 21: Creatures in the sea

- Phylum Cnidaria: jellyfish, hydra, and sea anemones
- Phylum Echinodermata: sea stars, sea urchins, and sea cucumbers

Lesson 22: Phylum Mollusca

- Characteristics of mollusks
- Class Bivalvia: clams, oysters, and mussels
- Class Gastropoda: snails, slugs, and conchs
- Class Cephalopoda: squid, octopus, and nautilus

Lesson 23: Phylum Arthropoda

- Characteristics of arthropods
- Class Insecta (the insects)
- Complete vs. incomplete metamorphosis
- Sub-Phylum Crustacea: crabs, lobster, and crayfish
- Class Arachnid: spiders, scorpions, and mites
- Class Chilopoda & Diplopoda: centipedes and millipedes

Lesson 24: Phylum Chordata Part I

- Characteristics of Chordates
- Sub-Phylum Urochordata: tunicates
- Sub-Phylum Cephalochordata: lancelets
- Sub-Phylum Vertebrates: jawless fish, cartilaginous fish, and bony fish

Lesson 25: Phylum Chordata Part II

Class Amphibians: salamanders, frogs, and caecilians
Class Reptilia: snakes, lizards, turtles, and alligators

Lesson 26: Phylum Chordata Part III

Class Aves: the birds
Class Mammalia

Lesson 27: EXAM 3

Lesson 28: Human Anatomy Part I

Skeletal System
Muscular System

Lesson 29: Human Anatomy Part II

Circulatory System
Respiratory System

Lesson 30: Human Anatomy Part III

Nervous System
Endocrine System

Lesson 31: Human Anatomy Part IV

Lymphatic System
Immune System
Integumentary System

Lesson 32: Human Anatomy Part V

Digestive System
Excretory System

Lesson 33: Human Anatomy Part VI

Reproductive System
Embryology & Human Development

Lesson 34: Introduction to Ecology

Lesson 35: EXAM 4