



## Science with A Spark

Fun, Practical Learning for Homeschoolers

# The Living World: Integrated Biology

A full-credit, year-long high school biology course taught in a small group setting — because science is way more fun when you're actually doing it. Students work through guided workbooks, get their hands dirty with real labs every unit, and finish each semester with an independent project they design and present themselves. Real science, real credit, real fun.

## 1st Semester

### Unit 1: Microbiology & the Invisible World

(ALIGNS WITH NGSS HS-LS1-1, HS-LS1-2, HS-LS1-3, HS-LS2-2, HS-LS3-2, HS-LS4-2, HS-LS4-3, HS-LS4-4, HS-LS4-5)

- Week 1 — The Invisible World: Students explore the difference between bacteria, human cells, and viruses, examine how DNA directs protein production, and discover why bacteria are essential — not just dangerous — to human health and ecosystems.
- Week 2 — Divide and Conquer: Students model bacterial population growth mathematically, trace a population through the four phases of the bacterial growth curve, and culture bacteria from real surfaces in lab — plates incubate at home for analysis the following week.
- Week 3 — Who Wins? Students investigate antibiotic resistance through the lens of natural selection and experimental design, observe and analyze their cultured bacteria plates, and connect human overuse of antibiotics to consequences that extend from the clinic into the broader ecosystem.

### Unit 2: Photosynthesis

(ALIGNS WITH NGSS HS-LS1-5, HS-PS4-1, HS-PS3-2, HS-LS1-6, HS-LS2-2, HS-LS2-5, HS-LS2-6)

- Week 1 - Light, Energy, and the Living Factory: Students explore how plants make food through photosynthesis, identify plant cell structures, and investigate how light wavelength determines what plants can and cannot absorb.
- Week 2 - How Photosynthesis Works: Students trace the two stages of photosynthesis from light energy to glucose, investigate how enzymes regulate chemical reactions, and run a leaf disk floating assay to observe limiting factors in action.
- Week 3 - The Cycle Continues: Students connect photosynthesis and cellular respiration as a continuous cycle of matter and energy, explore the carbon cycle, and build a sealed terrarium to watch life sustain itself in a closed system.

### Unit 3: Natural Selection & Ecosystems

(ALIGNS WITH NGSS HS-LS4-1, HS-LS4-2, HS-LS4-3, HS-LS4-4, HS-LS4-5, HS-LS2-1, HS-LS2-2, HS-LS2-4, HS-LS2-6, HS-LS2-7)

- Week 1 – What is Natural Selection? Students explore the four conditions required for natural selection, distinguish heritable from non-heritable variation, and examine how traits across bear and fox species reflect the selection pressures of their environments.
- Week 2 – Pressure and Time: Students investigate how selection pressure acts on populations over time using documented evidence – including peppered moths and Galápagos finches – analyze comparative anatomy across species, and design a fictional species adapted to a real biome.
- Week 3 – The Web of Life: Students explore how species depend on each other to survive, what happens when one is removed, and how human activity is changing ecosystems faster than nature can keep up.

### Independent Project & Semester Wrap Up

(ALIGNS WITH HS-ETSI-1, HS-ETSI-2, HS-ETSI-3)

- Week 1: Students design and run a simple experiment based on anything covered this semester, documenting their question, method, and results.
- Week 2: Students present their findings in any format of their choosing – see the Independent Project Guide for options and requirements.
- Week 3: Review – Game Show Style

## 2nd Semester

### Unit 4: The Inheritance Game: Genetics and Heredity

(ALIGNS WITH NGSS HS-LS1-1, HS-LS3-1, HS-LS3-2, HS-LS3-3)

- Week 1 – Your Body's Instruction Manual: Students explore the structure of DNA, how genes code for proteins, and how alleles – dominant, recessive, and everything in between – determine what traits get expressed and why.
- Week 2 – Beat the Odds: Students use monohybrid and dihybrid Punnett squares to predict inheritance patterns across generations, apply probability to real genetic scenarios, and explore why Mendel's laws explain so much about why families look the way they do.
- Week 3 – What's Your Type?: Students investigate codominance through the lens of ABO blood typing, determine their own blood type using a real lab kit, connect their results to possible genotypes, and solve a museum heist using blood type evidence.

### Unit 5: How Life Continues

(ALIGNS WITH NGSS HS-LS1-2, HS-LS1-4, HS-LS1-7, HS-LS3-1, HS-LS3-2)

- Week 1 – Copy, Don't Improvise: Students explore why cells divide, trace the cell cycle from DNA replication through the four stages of mitosis, and examine how the cell's internal checkpoint system keeps the process from going wrong.

- Week 2 – Never the Same Twice: Students distinguish meiosis from mitosis, investigate how genetic variation is generated, and work through a medical mystery to connect cell division errors to real chromosomal conditions.
- Week 3 – Sugar Rush: Students investigate whether sugar concentration affects how fast yeast cells divide, connect sugar availability to cellular energy production, and draw evidence-based conclusions from microscope observations.

## Unit 6: How the Body is Built

(ALIGNS WITH NGSS HS-LS1-1, HS-LS1-2, HS-LS1-3, SEP-2, SEP-3, SEP-6)

- Week 1 – From Cells to Tissues: Students learn the four tissue types, explore why structure matches function in each, and build physical models to test tissue properties.
- Week 2 – From Tissues to Organs: Students define what makes an organ an organ, examine how tissue types depend on each other to function, and build a working lung model.
- Week 3 – From Organs to Systems: Students map the body's 11 organ systems, investigate how systems depend on each other to maintain function, and build a physical model of the digestive system.

## Independent Project & Semester Wrap Up

(ALIGNS WITH HS-ETS1-1, HS-ETS1-2, HS-ETS1-3)

- Week 1: Students choose a disease or condition affecting any organ system covered this semester, research how the organ normally functions, what the disease does to it, and how it is treated.
- Week 2: Students present their findings in any format of their choosing – see the Independent Project Guide for options and requirements.
- Week 3: Review – Game Show Style