LIFE SCIENCE · KINDERGARTEN–GRADE 8 · QUICK REFERENCE

# Life Science (Cells · Plants · Animals · Body)

Grades K–8 · 3 pages

Living things and cells, plants and photosynthesis, Linnaeus and the vertebrate classes, life cycles, habitats, food chains and animal design, the human body's systems, senses and healthy habits, Mendel and DNA, variation within kinds, and origins as the course teaches them.

1 Cells · 2 Plants · 3 Animal kinds · 4 Habitats & food chains · 5 Human body · 6 Heredity & origins

## 1 LIVING THINGS & CELLS

grades 5–7 · the small world

### What is alive

Living things are made of **cells**, grow, use energy (eat), breathe (respire), respond, reproduce, and need water. A rock does none of these. Levels: cell → tissue → organ → organ system → organism.

### Cell theory

- Robert Hooke saw "cells" in cork (1665); Leeuwenhoek saw "animalcules" in pond water (1676).
- Schleiden and Schwann (1838–39): all living things are made of cells, and cells are the basic unit of life.
- Use a microscope: lowest power first, coarse focus then fine, slide clean, never let the lens touch it.

### Organelles: the working parts

| Part | Job |
|---|---|
| cell membrane | gate: lets things in and out |
| nucleus | control center; holds the DNA |
| cytoplasm | jelly where the parts float |
| mitochondria | power plants: release energy from food |
| ribosomes | build proteins |
| vacuole | storage of water and food (large in plants) |
| chloroplast | plants only: captures light for photosynthesis |
| cell wall | plants only: stiff outer box |

**Plant cells** have a cell wall, chloroplasts and one big vacuole; **animal cells** are rounder and lack them.

### Tiny life

- **Bacteria:** one cell, no nucleus; most are helpful (yogurt, soil), some cause disease.
- **Protists:** one-celled pond life: amoeba, paramecium, algae.
- **Fungi:** mushrooms, molds, yeast; they digest food outside themselves and spread by spores. Never eat a wild mushroom.
- **Yeast** eats sugar and breathes out carbon dioxide: bread rises.

### Germ fighters

| Who | When | What |
|---|---|---|
| Jenner | 1796 | smallpox vaccine |
| Semmelweis | 1847 | handwashing saves mothers |
| Pasteur | 1860s | germs cause disease; no spontaneous generation |
| Lister | 1860s | clean surgery |
| Fleming | 1928 | penicillin |

## 2 PLANTS

grades K–7 · seeds, leaves, light

### Plant parts and jobs

| Part | Job |
|---|---|
| roots | anchor; drink water and minerals |
| stem | holds up; carries water and food |
| leaves | make food from light |
| flower | makes seeds (petals, sepals, stamen with pollen, pistil) |
| fruit | protects and spreads seeds |
| seed | baby plant with packed lunch (seed coat, embryo, food store) |

### A seed grows

**Germination** needs water, warmth and air; the root comes out first, then the shoot. Seeds travel by wind (dandelion), water (coconut), animals (burrs, berries) and bursting pods.

### Photosynthesis

In the **chlorophyll** of the leaves (green). Van Helmont's willow (1648) gained 164 pounds from water and air, not soil.

**water + carbon dioxide + light → sugar + oxygen**

### Respiration

Every living cell does it, day and night. Plants make oxygen by day and use some of it too.

**sugar + oxygen → energy + carbon dioxide + water**

### Pollinators

Bees, butterflies, hummingbirds and wind carry **pollen** from stamen to pistil; then the flower makes fruit and seed. No bees, no apples.

### Plant groups

| Group | Marks | Examples |
|---|---|---|
| Mosses | no roots or veins, damp places | moss |
| Ferns | veins, spores under fronds | fern |
| Conifers | cones, needles, evergreen | pine, spruce, fir |
| Flowering plants | flowers, fruit, seeds | oak, grass, rose, corn |

**Monocots** (one seed leaf, parallel veins: grass, lily) and **dicots** (two seed leaves, branching veins: bean, oak).

### Trees

**Deciduous** trees drop leaves in fall; **evergreens** keep them. Count a tree's rings for its years; wide rings mean good years. Bark protects; the thin layer under it is alive.

**MEMORY TRICK** **Leaves eat light**

**Photo** = light, **synthesis** = putting together: leaves put sugar together from light, water and air.

## 3 ANIMALS: CLASSIFICATION & KINDS

grades K–4 · Linnaeus and the great families

### Linnaeus sorts the world (1735)

**Kingdom → Phylum → Class → Order → Family → Genus → Species.** Every creature has a two-part Latin name: *Homo sapiens*, *Canis familiaris*. The genus is capitalized, both words in italics.

**MEMORY TRICK**

**King Philip Came Over For Good Soup**

Kingdom, Phylum, Class, Order, Family, Genus, Species: from the biggest group to the smallest.

### Vertebrate or not

**Vertebrates** have a backbone: fish, amphibians, reptiles, birds, mammals. **Invertebrates** do not: insects (6 legs, 3 body parts, antennae), spiders (8 legs, 2 parts), crabs, snails and clams (mollusks), worms, jellyfish, starfish. Most animals are invertebrates.

### The five vertebrate classes

| Class | Covering | Breathes | Blood | Young |
|---|---|---|---|---|
| Fish | scales | gills | cold | eggs in w |
| Amphibians | moist skin | gills, then lungs | cold | eggs in w metamo |
| Reptiles | dry scales | lungs | cold | leathery on land |
| Birds | feathers | lungs | warm | hard-she eggs |
| Mammals | hair or fur | lungs | warm | born alive; drink mi |

Warm-blooded animals keep a steady temperature; cold-blooded take the temperature around them. A whale is a mammal; a penguin is a bird; a frog is an amphibian; a turtle is a reptile.

### Life cycles

- **Complete metamorphosis:** egg → larva (caterpillar) → pupa (chrysalis) → adult butterfly.
- **Incomplete:** egg → nymph → adult (grasshopper).
- **Frog:** egg → tadpole (gills, tail) → froglet → frog (lungs, legs).
- **Chicken:** 21 days in the egg. **Mammals** are born alive and nursed.

### Dinosaurs

Dinosaur **kinds** are sorted by hips (lizard-hipped, bird-hipped), teeth and feet; eggs and nests are found. Behemoth (Job 40:15–24) and sea monsters are read alongside; the course weighs soft tissue in fossil bone and the feather claims.

## 4 HABITATS, FOOD CHAINS & ANIMAL DESIGN

grades 1–6 · how creatures live

### Habitats and biomes

| Habitat | Marks | Creatures |
|---|---|---|
| Forest | trees, four seasons | squirrel, deer, owl, fox |
| Pond | still fresh water | frog, dragonfly, duck, minnow |
| Ocean | salt water, zones by depth | whale, shark, coral, tuna |
| Desert | under 10 in rain a year | camel, lizard, cactus, kangaroo rat |
| Arctic / tundra | frozen ground | polar bear, seal, arctic fox, caribou |
| Grassland / savanna | grass, few trees | bison, lion, zebra, prairie dog |
| Rain forest | hot, wet, layered | monkey, parrot, jaguar, orchids |

### Food chains

**Sun → producer → consumer → consumer → decomposer.** Grass → rabbit → fox; the fungi and worms return it to soil. **Producers** (plants) make food; **herbivores** eat plants, **carnivores** eat animals, **omnivores** both; **decomposers** break the dead down. Many chains linked make a **food web**; each step up keeps only about a tenth of the energy, so there are many mice and few hawks.

### Animal defenses

**Camouflage** (chameleon, cuttlefish, peppered moth), **warning colors** (monarch, coral snake), armor (armadillo, turtle), speed, spines, playing dead, smells (skunk), mimicry.

### Designed to do it

- **Flight:** hollow bones, feathers, wings curved on top (lift); the Wrights watched buzzards (1899).
- **Migration:** Arctic terns fly pole to pole; monarchs reach Mexico; birds steer by sun, stars and magnetism (Jeremiah 8:7).
- **Echolocation:** bats and dolphins "see" with sound (Spallanzani, 1793). Sound travels about 1,100 ft/s in air.
- **Instinct:** spiders spin, beavers build, wasps nest without being taught (Job 39).
- **Social animals:** honeybee dance language, wolf packs, elephant matriarchs, leafcutter ants that farm.
- **Biomimicry:** Velcro from burrs (1941), shark skin, gecko feet.

**MEMORY TRICK** **Producers first**

Every food chain starts with the **sun** and a **green plant**. Arrows point the way the energy goes: toward the eater.

## 5 THE HUMAN BODY

grade 5 · fearfully and wonderfully made (Psalm 139:14)

### Organ systems

| System | Main parts | Job |
|---|---|---|
| Skeletal | 206 bones, joints, cartilage | frame, protection, makes blood cells |
| Muscular | 600+ muscles in pairs | movement; muscles only pull |
| Digestive | mouth, esophagus, stomach, small and large intestine (about 9 m) | break food into fuel |
| Respiratory | nose, windpipe, lungs, diaphragm | oxygen in, carbon dioxide out |
| Circulatory | heart (4 chambers), arteries, veins, capillaries | carries blood everywhere; Harvey, 1628 |
| Nervous | brain, spinal cord, nerves | control, senses, reflexes, memory, sleep |
| Skin | skin, hair, nails | covering, touch, temperature |
| Immune | white blood cells, antibodies | fights germs |

### Blood

**Red cells** carry oxygen, **white cells** fight germs, **platelets** clot, **plasma** is the liquid. "The life of the flesh is in the blood" (Leviticus 17:11). Pulse: about 70–100 beats a minute at rest for a child, 60–100 for an adult; breathing about 12–20 a minute.

### Senses

- **Eye:** cornea, pupil, iris, lens, retina, optic nerve; the image lands upside down and the brain flips it.
- **Ear:** eardrum, three tiny bones, cochlea; also balance.
- **Taste** (sweet, salty, sour, bitter) works with **smell**; **touch** is densest on fingertips and lips.

### Teeth

20 baby teeth, 32 adult teeth: incisors cut, canines tear, molars grind. Brush twice a day.

### Healthy habits

- Wash hands with soap for 20 seconds (Semmelweis).
- Sleep 9–12 hours (children); the brain files memory while you sleep.
- Eat from every food group: grains, vegetables, fruits, protein, dairy; drink water.
- Exercise daily; lung capacity and heart grow with use.
- Smoke blackens lungs; never start.
- First aid: pressure on a cut, cool water on a burn, call for help.

MEMORY TRICK

**Two halves, crossed wires**

The **left** brain runs the **right** side of the body and vice versa. A reflex (knee jerk) skips the brain: spinal cord only.

## 6 HEREDITY, DESIGN & ORIGINS

grade 8 · as the course teaches it

### Mendel's peas (1856–63)

Traits come in pairs of **genes**, one from each parent. A **dominant** gene (T) shows whenever present; a **recessive** gene (t) shows only as tt. **Genotype** is the gene pair; **phenotype** is what you see.

### Punnett square: Tt × Tt

| | T | t |
|---|---|---|
| **T** | TT | Tt |
| **t** | Tt | tt |

3 tall : 1 short. A **pedigree** chart traces a trait through a family.

### DNA

- A **double helix** (Watson, Crick and Franklin's Photo 51, 1953) of four letters: A pairs with T, C with G.
- A **gene** is a stretch of DNA that spells a **protein**; the code is information, like a written language.
- Every cell carries the whole book; strawberry DNA can be pulled out in a kitchen.

### Variation within kinds

Finch beaks, dog breeds and antibiotic resistance show real change **within** a kind, sorting and losing information rather than building new body plans. The course calls the created kind a **baramin**.

### Origins fairly told

- **Creation** in Genesis 1–2: God made each kind, and man in His image.
- **Darwin's theory**, stated accurately: variation, more born than survive, natural selection, descent with modification over long ages.
- **Intelligent design:** Paley's watch (1802), the eye, the bacterial flagellum, fine-tuning point to a designer.
- The Cambrian explosion, dinosaur soft tissue and the claimed transitions (Archaeopteryx, Tiktaalik) are read from each side; the student writes a respectful comparison.

### Stewardship

**Dominion and care** (Genesis 1:28; 2:15): count populations, manage game, conserve. The bison and the whooping crane came back. Careers: veterinarian, nurse, doctor, wildlife biologist, game warden, agricultural scientist (Borlaug's wheat).