Lesson 1: What is Life?

Scientists love the idea of searching for life on other planets, but we haven't even finished finding all the life on our own planet—not even close! There are millions of different kinds of living things on Earth, and probably millions more we have yet to discover.

I. Biology is the study of life

II. What are the characteristics of living things?

A. Growth
    1. Occurs when living things grow larger
    2. Occurs when old cells are replaced with new cells

B. Organization: cells are the smallest basic unit of living things
    1. Cells are organized with tiny parts called organelles that function as the machinery of the cell
    2. Multicellular organisms have many cells organized to work together and form tissues and those tissues are organized to work together to form organs

C. Response: living things respond to their environment

D. Reproduction: living things are able to make similar living things with similar characteristics

E. Energy: energy is the food that allows living things to grow and reproduce.

Lesson 2: The Building Blocks of Life

In order to understand what "life" is, we first have to look at the smallest living thing: the cell. Every living thing has cells—your own body has trillions of cells. They are the smallest, most basic kind of life on Earth.

I. The cell is the basic unit of organization of all living things

A. Discovered by Robert Hooke
B. Main parts of a cell
    1. Cell membrane: surrounds the cell and lets things in and out
    2. Cytoplasm: a jelly-like substance that fills the inside of the cell
    3. Genetic material: cell instruction manual
C. Cell theory: all things are made up of cells

II. Types of cells

A. Prokaryotic
    1. A cell with free-floating DNA
    2. One-celled organisms
B. Eukaryotic
    1. A cell with DNA in a nucleus
    2. Multicellular organisms

Lesson 3: The Secret Code of Life!

Almost every cell in your body—in every organism—comes with its own instruction manual. This instruction manual tells each cell exactly what to do. It's called DNA, and DNA is the special code that makes cells so powerful.

I. DNA: the instruction manual of the cell

A. Every cell has a complete copy of DNA
B. Holds instructions for cells to build proteins

II. DNA structure: double helix

A. Two spirals put together that look like a twisted ladder
B. Four bases
    1. Each base fits with another to form a base pair
    2. Base pairs are the rungs of the double helix

III. RNA: ribonucleic acid

A. Transcription: DNA unzips, so a small piece can be copied
B. RNA is the copy of a piece of DNA
C. RNA travels to the ribosomes
D. Amino acids come together in the ribosomes following the code on RNA to create a specific protein

Lesson 4: Fueled Up!

Just like every car needs gas to move, every living organism needs energy to survive, but not all organisms get their energy in the same way!

I. **Energy: The ability to do work**

II. **Where does energy come from?**

- A. Heterotrophs
  1. Eat other organisms for energy
  2. Examples: humans, animals, fungi, and many bacteria.
- B. Autotrophs
  1. Makes its own food using energy from the sun, water, and carbon dioxide
  2. Examples: grass, ferns, trees, bushes, flowers, and vegetables

III. **The Food Chain: a diagram showing how energy is moved between organisms**

- A. Decomposers: organisms that eat other dead organisms and break them down into nutrients that can be used by other organisms
- B. Autotrophs or consumers: eat other organisms for food
- C. Heterotrophs or producers: make their own food

Lesson 5: What's in a Name?

There are millions of different types of creatures in this world, and while they're all unique, many share similar characteristics. We can use these characteristics to help categorize them or divide them into similar groups.

I. History of Classification Systems

A. A system for organizing things, putting things into groups, or putting them in order

B. The system we use today was developed by Carl Linnaeus over 200 years ago

1. Expanded on Aristotle's original classification system of two groups: plants and animals
2. The system has grown to use different levels as we have learned more about the world of living things

II. Our Classification System

A. Today, all living things are divided into 6 kingdoms

1. Plant, animal, fungi, protista, arachaebacteria, or eubacteria
2. Kingdoms are big broad groups with many organisms in each one

B. From least to most specific

1. Kingdom, phylum, class, order, family, genus, and species
2. Helps us to know how organisms are alike and different from each other
3. Example: American Bullfrog: Kingdom *Animal*, Phylum *Chordata,* Class *Amphibia,* Order *Anura,* Family *Ranidae,* Genus *Lithobates,* Species *American Bullfrog*

Lesson 6: Biomes Everywhere!

Living things don't just live off somewhere all by themselves. They live in an environment. Each living thing lives in a whole community of other living and nonliving things—and it's the study of these communities we call ecology.

I. Ecology: the study of how living and nonliving things interact

II. Biome: a region of the world with a certain kind of climate along with all the living creatures living there

A. Tundra: coldest of all biomes where very few plants are able to survive
   1. Located in the Arctic Circle and extends across the northernmost portions of North America, Europe, and Asia
   2. Harsh winters and short summers

B. Coniferous forest: a biome with many cone-bearing trees, low shrubs, and herbs on the forest floor
   1. Found south of the tundra areas throughout Canada, USA, northern parts of Europe, and Russia
   2. Long cold winters with heavy snowfall, but permafrost is rare
   3. Warm, humid summers

C. Deciduous Forest: a biome with many trees that lose their leaves before the winter and grow them back in the spring.
   1. Found further south than the coniferous forests, in eastern parts of the US, as well as much of Europe and Eastern Asia
   2. Tends to have 4 full seasons: winter, spring, summer, fall

D. Grassland: a biome where grasses and shrubs thrive, but there aren't many trees
   1. Cold winters and warm summers, but unlike forests they don't get enough rain for trees to survive.
   2. You find grasslands in the prairies and plains found in the US, Ukraine, Russia, South America, South Africa, and Argentina

E. Desert: hottest, driest of all biomes getting less than 10 inches of rain per year

1. Found in the southwest US, Southern Asia, South and Central America, Ethiopia, and Australia
2. Plants that live in deserts have adapted to the low rainfall so they can survive

E. Tropical rainforest: receives more rainfall than any other biome

1. Found near the equator line in Central and South America, Western Africa, Eastern Madagascar, India, Southeast Asia, and Australia
2. Over half of the world's plant and animal species live in rainforests

F. Aquatic biome: oceans, lakes, rivers, streams, ponds, and marshes

Lesson 7: Itsy bitsy teeny tiny creatures

Bacteria don't get a lot of our attention today unless the doctor tells us we have a bacterial infection. But many bacteria are helpful and they're a much bigger part of our lives than you can imagine!

I. Characteristics of bacteria

A. Single-cell prokaryotes with free-floating DNA
B. Don't have a nucleus
C. Get shape from the cell wall
D. Reproduce asexually
E. Use projections called pili to stick to the surface
F. Decomposers: eat dead or decaying things

II. Kingdoms of bacteria

A. Archaebacteria
    1. Live in extreme environments
    2. Examples: super hot mud, the bottom of the ocean, the stomach of a cow
B. Eubacteria
    1. Common bacteria found in many everyday places
    2. Live all around us, even inside our bodies
    3. Most bacteria are beneficial
    4. Examples: bacteria in your stomach help you digest food and bacteria in food such as yogurt and certain cheeses that provide nutrients

Lesson 8: The Junk Drawer Kingdom

There are some creatures that don't seem to fit anywhere—they are just too different from other living things we know. That's where the kingdom of protists comes in: it's the living world's island of misfit creatures.

I. Kingdom Protista: Eukaryotic creatures that don't belong in any other kingdom

A. Have a nucleus to hold their DNA
B. Have a lot of little organelles in their cells that are little structures that do different tasks

II. Characteristics of Protists

A. Mostly found in water, near water, or soil that has a lot of water in it
B. Divided into 3 groups
    1. Protozoans: animal-like protists
        a. Move around
        b. Heterotrophs
        c. Most are just one cell, unlike animals that have multiple cells
        d. Examples: amoebas, giardia, paramecium, and cilia
    2. Algae: plant-like protists
        a. Autotrophs
        b. Unlike plants, they don't have stems, leaves, and roots
        c. Examples: green algae, brown algae, and diatoms
    3. Molds: fungus-like protists
        a. Decomposers
        b. Different than fungi because they move and creep along the ground
        c. Example: slime mold that oozes along the ground gobbling up dead plants

Lesson 9: The Fungus Among Us!

This lesson is all about some creatures with a very important job —ridding the world of dead and decaying organisms. Fungi are found all over the world in every single biome. Without them, the world would be covered in dead organisms.

I. Fungi Characteristics

A. Eukaryotic
B. Have cell walls
C. Most are multicellular
    1. Yeast is the only type of fungus made up of one cell
    2. Multicellular fungi are made of tiny thread-like filaments called hyphae
D. Heterotrophs
    1. Use external digestion, absorbing nutrients through their cells
    2. Fungi live in their food because they need their bodies to touch what they eat in order to absorb it
E. Decomposers
    1. Break down dead decaying stuff
    2. Other organisms can then reuse the nutrients
F. Immobile

II. Fungi Usefulness

A. Break down dead organisms in the environment
B. Can serve as an important type of medication called antibiotics
C. Good source of food

Lesson 10: What is a Plant?

Plants are everywhere on planet Earth. There are hundreds of thousands of different kinds of plants, and thousands more are discovered each year!

I. Plant Characteristics

A. Eukaryotic
B. Multicellular
C. Have cell walls
D. Immobile
E. Autotrophic
    1. Make their own food through photosynthesis
    2. Plants use water, carbon dioxide from the air, and energy from the sun to make glucose for food
        a) Water is absorbed from the ground
        b) Air enters their leaves through tiny openings called stomata
        c) Chloroplasts, in their leaves, capture energy from the sun
F. Producers

II. Specialized tissues and organs

A. Roots
B. Stems
C. Leaves
D. Reproductive structures

Lesson 11: The Wide World of Plants

With so many different plants in the world, it's tough to keep them all straight. But there are certain features we can see in plants that allow us to put them into helpful categories.

I. 4 Major Groups

A. Mosses: Bryophytes
B. Ferns: Pteridophytes
C. Conifers: Gymnosperms
D. Flowering Plants: Angiosperms

II. Vascular vs Nonvascular Plants

A. Vascular plants
    1. Use special tissues to carry water and minerals
    2. Examples: ferns, conifers, and flowering plants
B. Nonvascular plants
    1. Must live in a place where they're surrounded by water
    2. Example: mosses

III. Different Types of Reproduction

A. Seeds
    1. Seeds have a protective coating around them
    2. Contain a food supply within them for the embryonic plant
    3. Examples: conifers, giant redwoods, and flowering plants
B. Spores
    1. Smaller than seeds
    2. No food supply or protective coating
    3. Examples: mosses and ferns

Lesson 12: Mean, Green, Energy-Making Machines

Without leaves, flowering plants would have no way to get the energy they need to survive. In this lesson, you'll learn what makes leaves so important and the tricks you can use to tell one plant from another.

I. Photosynthesis

A. Process plants use to make their food
B. Takes place in the leaf
    1. Epidermis: outside layer of the leaf, one cell thick
    2. Stomata
        a) Small pores on the bottom of the leaf
        b) Allow carbon dioxide to enter the leaf and oxygen to exit
    3. Chloroplasts
        a) Organelles that absorb energy from the sun
        b) Energy is used along with water from the soil and molecules in the air to make sugars to feed the plant

II. How Botanists Classify Leaves

A. Leaf shape
B. Venation: the shape of veins running through the leaf
    1. Parallel
    2. Pinnate
    3. Palmate
C. Margin: edge of leaf

Lesson 13: Roots & Shoots

What allows a plant to get water from the ground? What allows the food made in plant leaves to get all around a plant? The answer is found in two important organs: stems and roots.

I. Shoots: also known as stems

A. Typically found above ground
B. Function
    1. Support the leaves and flowers of the plant
    2. Carry water, nutrients, and food around the plant
    3. Some plants store food in stems

II. Roots

A. Typically found underground
B. Function
    1. Anchor the plant
    2. Collect water and nutrients for the plant
    3. Some store food, such as carrots and turnips
C. Types of roots
    1. Taproots grow deep into the soil and typically store food
    2. Fibrous roots have lots of branching roots that form a tangled mass

III. Types of tissue

A. Xylem tissue carries nutrients and water from the root to the leaves for photosynthesis
B. Phloem tissue carries the food created by photosynthesis in the leaves down to the roots

Lesson 14: The Reason for Flowers

Flowers can be beautiful gifts to give someone, but they weren't designed by God just to be pretty decorations for our home. Flowers have a special purpose: they help make seeds which create new mature plants.

I. Flowers: reproductive organs of a plant

A. Most plants have both male parts and female parts (perfect flowers)

B. Parts of a flower

1. Receptacle: slightly thickened part of the stem from where the flower grows
2. Sepals
    a) Green, leaf-like structures arranged in a ring
    b) Protects the other parts of the flower while it is growing
3. Petals
    a) Typically large and brightly colored
    b) Attracts bees and insects to pollinate
4. Stamen
    a) Male portion of the flower
    b) Has an anther covered in pollen
5. Pistil
    a) Female portion of the flower
    b) Has a stigma that is sticky which collects pollen

II. Plant Reproduction

A. Pollination: pollen travels from the stamen to the pistil often with the help of insects, other animals, or the wind

B. Fertilization: occurs after pollination when the pollen travels down the pistil into the ovaries of the plant

Lesson 15: It Begins with a Seed

Most of us have a favorite kind of fruit. Some of us love bananas or apples or peaches. Some of us love berries, avocados, or olives. But why do plants go to all the trouble to make fruit in the first place? It's not just to feed us, but to carry the seed away from the parent plant.

I. After fertilization

A. The flower loses its petals, stamen, and sepals
B. The ovary grows into a fruit, surrounding the seed formed by the male and female cells which fused together

II. Plants make fruit and seeds are dispersed

A. People or animals eat the fruit and discard the seeds
B. Dry fruits have hooks attaching themselves to animals
C. The wind moves seeds

III. Seed characteristics

A. The right amount of water, oxygen, temperature, sunlight, and soil for growth to begin
B. Germination: seed begins to sprout
C. Contains the plant embryo, outer protective covering, and food

Lesson 16: The Amazing Animals

Animals are everywhere, and there are so many different kinds of animals. But did you know there are certain things that are true of all animals, no matter how big or small, no matter their shape, their size, or their color?

I. Shared Characteristics of the Animal Kingdom

A. Heterotrophic: must consume their food
    1. Diets vary from animal to animal
    2. Three types of diets:
        a) Carnivores: eat other animals
        b) Herbivores: eat plants
        c) Omnivores: eat both plants and animals

B. Multicellular

C. Have skeletons
    1. Endoskeleton: inside their body
    2. Exoskeleton: outside of their body
    3. Hydroskeleton: water-filled compartments in their body

II. Two Categories of Animals

1. Vertebrates: have a backbone
2. Invertebrates: do not have a backbone

Lesson 17: Silly Sea Sponges

You've probably used a sponge to clean the dishes, but you may not know that sponges are actually animals! These creations have features that are true of no other creatures on earth.

I. Characteristics of Phylum Porifera

A. Animals
B. Heterotropic: filter water for food
C. Live in the water
D. Sessile as adults: stay in one place
E. Physical characteristics
    1. Pores all over their bodies
    2. Body is hollow and sac-like without a brain or organs
    3. Invertebrate
    4. Exhibits asymmetry

II. Types of Symmetry

A. Asymmetrical: you can not draw a line where both sides look the same
B. Radial symmetry: you can draw a line through an organism several different ways and it looks the same on both sides
C. Bilateral symmetry: you can draw a line through an organism dividing it into left and right sides that look the same

Lesson 18: Wiggly Worms

You might think worms are disgusting, but some of them (believe it or not) are actually quite beautiful, colorful creatures, and all of them have an important place in God's creation. There are tens of thousands of different kinds of worms in the world.

I. Common Characteristics of Worms

A. Invertebrate
B. Bilaterally symmetrical
C. Narrow bodies with no legs
D. All have a head and a tail

II. Worm Phyla

A. Platyhelminthes: flatworms
    1. Incomplete digestive system: one opening in the middle of their bodies for both eating and expelling waste
    2. Free-living or parasitic
B. Nematoda: roundworms
    1. Look like strings
    2. Complete digestive system: have 2 openings: a mouth for eating and an anus for expelling waste
    3. Free-living or parasitic
C. Annelida: segmented worms
    1. Complete digestive system: have 2 openings: a mouth for eating and an anus for expelling waste
    2. Have rings around their bodies with repeating segments

Lesson 19: Majestic Medusas and Patient Polyps

From coral reefs to glowing jellyfish, cnidarians are some of the most beautiful forms of life in the ocean. They may look tranquil but don't be fooled—they are vicious predators ready to kill.

I. Phylum Cnidarian

A. Name comes from stinging cells on their tentacles
B. Includes over 10,000 different species

II. Characteristics

A. Radially symmetrical
B. Invertebrate
C. Tentacles with stinging cells extend from their sac-like body
    1. Used to capture prey
    2. Stinging cells are called cnidocytes and contain toxins
D. Incomplete digestive system: single opening for food and waste

III. Types of Cnidarians

A. Polyps
    1. Cup-shaped and looks like a tube with a mouth and tentacles at one end and a base that attaches to a hard surface on the other end
    2. Tend to stay in one place and not move around
    3. Example: Coral
B. Medusa
    1. Umbrella-shaped body with a mouth facing downward and tentacles all around the mouth
    2. Free-swimming
    3. Example: jellyfish

Lesson 20: Spiny Skinned Savages

How would you like to have 5 arms instead of 2? How about 200 arms? How about spikes all over your body? This is the life of an echinoderm.

I. Echinoderm Characteristics

A. Spiny skin
B. Invertebrate
C. Complete digestive system: one opening for food and another for waste
D. Water vascular system: a system of tubes filled with water extending throughout the animal's entire body
E. Open circulatory system: blood is pumped straight into the body cavity of the organism

II. Living Classes of Echinoderms

A. Class Asteroidea
    1. Sea stars
    2. Thick arms extending from a central disk
B. Class Ophiuroidea
    1. Brittle stars
    2. Long thin arms extending from a central disk
C. Class Echinoidea
    1. Sea urchins
    2. Very hard and rigid with long sharp spines
D. Class Crinoidea
    1. Sea lilies and feather stars
    2. Many arms
    3. May look like a plant
E. Class Holothuroidea
    1. Sea cucumbers
    2. Look like a long tube when seen on the ocean floor

Lesson 21: Meddlesome Mollusks

From the tiny Borneo snail to the enormous Colossal Squid, mollusks come in all shapes and sizes, but with their powerful muscular feet and their beautiful shells, they are the largest groups of aquatic animals on earth!

I. Characteristics of Phylum Mollusca

A. Largest group of aquatic animals
B. Bilaterally symmetrical
C. Invertebrates
D. Muscular foot helps the animal move and anchors it in one place
E. A soft body with a visceral mass containing many vital organs
F. Many have a shell

II. Classes of Molluscs

A. Class Bivalvia: “two doors”
    1. Two shells
    2. Examples: clams, oysters, mussels, scallops, and geoducks
B. Class Gastropoda: “Stomach foot”
    1. Moves on their bellies using a muscular foot
    2. Coiled shells
    3. Examples: snails, slugs, conchs, and abalones
C. Class Cephalopoda: “Head foot”
    1. Multiple muscular feet helps the animal move or anchors it in place
    2. Examples: squid, octopus, nautilus, and cuttlefish

Lesson 22: Armored Arthropods and the Crabby Crustaceans

Wouldn't it be cool to have your own built-in armor? That's what arthropods have —hard skeletons outside their bodies to keep them safe and give them structure. These creatures are some of the most plentiful animals on the earth.

I. Phylum Arthropod: "Jointed Leg"

A. They have an exoskeleton: found on the outside of the body
    1. Encases the entire body
    2. Must be shed by molting
B. Body is divided into segments
    1. Most have a head, thorax, abdomen
    2. Cephalothorax: fused head and thorax

II. Class Crustacea

A. Characteristics
    1. Have 5 pairs of legs, 10 legs in total
    2. Jointed legs divide into branches
    3. Use pincers for grooming, fighting, and to capture prey
    4. Use swimmerets on their telson to help them swim
B. Examples: barnacles, crabs, lobsters, crayfish, shrimp, woodlice, and beach fleas

Lesson 23: Intrepid Insects & Spindly Spiders

Insects and arachnids are some of the most abundant creatures on the planet, with millions of species just waiting to be discovered. These creatures can be found in every continent on Earth.

I. Phylum Arthropoda

A. Class Insecta

1. Characteristics
    a) Head: antenna, eyes, and mandibles
    b) Thorax: 6 walking legs and wings
    c) Antenna, eyes, and mandibles on their head
2. Metamorphosis - the life cycle
    a) Incomplete metamorphosis
        (1) Egg: the beginning stage before the insect hatches
        (2) Nymph: a small version of what the adult insect will look like
        (3) Adult: after the final molt, a fully-grown insect
    b) Complete Metamorphosis
        (1) Egg: the beginning stage before the insect hatches
        (2) Larva: undergoes a complete metamorphosis, doesn't look like the adult version of the insect
        (3) Pupa: undergoes changes inside and out
        (4) Adult: emerges from the pupa as a full adult insect

II. Class Arachnida

A. Examples: spiders, mites, ticks, and scorpions

B. Characteristics

1. Have two body segments
    a) Cephalothorax: fused head and thorax
    b) Abdomen
2. Have 4 pairs of jointed legs (8 total legs)
3. Appendages
    a) Chelicerae: used to capture and crush prey
    b) Pedipalps: feeding and sensing their environment

Lesson 24: The Vast World of Vertebrates

Vertebrates are creatures with a backbone—and what an important trait it is. No matter what kind of vertebrate we're talking about, whether we're talking about birds, fish, amphibians, reptiles, or mammals, that backbone protects every vertebrate's powerful nervous system.

I. Phylum Chordata

A. Almost all are vertebrates
    1. Have a backbone
    2. Have a spinal cord protected by the backbone
B. Endoskeleton
    1. Skeleton is inside the body
    2. Made of bone and cartilage
    3. Gives the body support, shape, and structure

II. Body Systems

A. Body with a head and a tail
B. Complete digestive system
    1. One opening for food
    2. One opening for waste
C. Closed circulatory system
    1. Blood cells are contained within blood vessels
    2. Contains a heart and arteries to pump and transport blood
D. Complex nervous system: a network that sends messages throughout the body
    1. Brain is the control center
    2. Spinal cord carries messages between the brain and the nerves
    3. Many nerves run throughout the body carrying messages to every part of the body

Lesson 25: Funky Fish

From the fearsome shark to the slippery hagfish, fish are some of the most abundant creatures in the water. There are many different kinds of fish in both the freshwater lakes and rivers and the salty waters of the ocean.

I. Jawless Fish

A. Kingdom Animalia, Phylum Chordata, Class Agnatha
B. Lack a jaw, appendages, and scales
C. Most are extinct
D. Living examples: hagfish and lamprey

II. Cartilaginous Fish

A. Kingdom Animalia, Phylum Chordata, Class Chondrichthyes
B. Skeleton is made of cartilage
C. Jaw is made of bone
D. Examples
    1. Skates and rays have flat, thin bodies with large pectoral fins fused to their heads
    2. Sharks have many rows of sharp teeth and sense electrical signals to hunt their prey

III. Bony Fish

A. Kingdom Animalia, Phylum Chordata, Class Osteichthyes
B. Have bony skulls and vertebral column
C. Contain cartilage in certain areas of their bodies
D. Have fins including:
    1. Tail fin
    2. Side fins
    3. Dorsal fin
    4. Tail fin
E. Most have overlapping scales

Lesson 26: Amazing Amphibians

Frogs, toads, salamanders—what do they all have in common? They all spend part of their life in the water and part on the land, a cross between a water creature and a land creature. These animals appreciate both sides of life.

I. Introducing the Amphibian

A. Means both sides of life
B. Spend the early part of their lives in the water
C. Spend their adult lives on land
D. Phylum Chordata

II. Characteristics of Amphibians

A. An endoskeleton made of bone
B. Diet
    1. Young amphibians are herbivores
    2. Adult amphibians are carnivores
C. Thin, smooth, moist skin
D. Amphibians are ectothermic
    1. Are not able to control their own internal temperature
    2. Depend on the environment to heat or cool their body
E. Amphibians are not endothermic
    1. Creatures able to control their own internal temperature
    2. Maintains a constant temperature
F. Undergo metamorphosis

III. Three kinds of amphibians

A. Order Anura
    1. “Tailless ones”
    2. Examples: frogs and toads
B. Order Urodela
    1. “Tailed ones”
    2. Examples: salamanders and newts
C. Order Apoda
    1. “Legless ones”
    2. Example: worm-like caecilians

Lesson 27: Resplendent Reptiles

The reptiles can be small lizards that crawl on the walls or terrifying monsters of the deep, but these cold-blooded carnivores have fascinated human beings for thousands of years.

I. Characteristics of Reptiles

A. Skin
    1. Dry, large, scaly, and waterproof
    2. Doesn't grow with them because it's not a living tissue
    3. Molts several times a year
B. Ectothermic
C. Hibernates by slowing down its body systems so it can survive very cold periods

II. Life Cycle of Reptiles

A. Begin their lives in a leathery egg
B. Baby reptiles look like miniature versions of adults
C. Grow until they reach full adult version

III. Classification of Reptiles

A. Kingdom: Animalia
B. Phylum: Chordata
C. Class: Reptilia
D. Orders
    1. Sphenodontia
        a) Many extinct species
        b) Reptile with a third eye on the top of its head
        c) Example: Only living species is the tuataras
    2. Crocodilia
        a) Semi-aquatic and live in warm areas
        b) Elongated snouts, powerful jaws, muscular tails, streamlined bodies
        c) Eyes and nostrils on top of head
        d) Examples: crocodiles, caimans, and alligators
    3. Squamata

    a) Large powerful jaws
    b) Examples: lizards and snakes
4. Testudines
    a) Have a hard shell, useful for protecting their body
    b) Example: turtles

Lesson 28: Blissful Birds

The group of animals in Class Aves are better known as birds—the great flying creatures of the world. Not that all birds fly, or that all flying creatures are birds, but birds are known for being the creatures that rule the sky.

I. Classification of Birds

A. Kingdom: Animalia
B. Phylum: Chordata
C. Class: Aves

II. Characteristics of Birds

A. Wings
    1. Most birds fly
    2. Very few birds don't fly: penguins and ostrich
B. Feathers
    1. Made of non-living tissue
    2. Lose a little bit at a time and replace the ones they lost
    3. Colorful to attract for mating
    4. Help camouflage to avoid predators
C. Endothermic
D. Beaks
    1. Different shapes and sizes depending on species
    2. Used to get food

III. Life Cycle of Birds

A. Reproduce sexually, there needs to be both a mother and a father
B. Mother lays eggs
    1. Keeps warm in a nest
    2. Have a hard shell
C. Eggs hatch and babies grow to adulthood, then leave the nest
D. Many groups fly together in flocks
E. Many migrate to warmer climates in the winter to find food

Lesson 29: Marvelous Mammals

Mammals are the only creatures on the planet with hair—some have a little, some have a lot. But it's this, plus a handful of other special traits, that make mammals among the most powerful and robust creatures on Earth.

I. Classification of Mammals

A. Kingdom: Animalia
B. Phylum: Chordata
C. Class: Mammalia

II. Characteristics of Mammals

A. Hair
    1. Can be all over the body, or cover certain parts
    2. Protects skin
    3. Camouflages
    4. Helps sense environment
    5. Can be used to defend: porcupine
    6. Insulation
B. Endothermic
    1. Regulate their own body temperature
    2. Utilize different strategies to maintain their body temperature
C. Lungs
    1. Bag-like organs in the chest used to inhale oxygen
    2. Exhale carbon dioxide
    3. Used in both land and aquatic mammals
D. Mammary glands
    1. Females produce milk to feed their young
    2. Unique to mammals

Lesson 30: Mini Mammals

Mammals don't all grow the same way when they are just formed. Some of them grow inside their mothers. Some grow in a pouch. And some, but not many, even grow inside eggs.

I. Life Cycle of Mammals

A. Birthed by their mother as smaller versions of the adults
B. Babies are unable to reproduce
C. Reach maturity and can reproduce

II. Three Groups of Mammals

A. Placental mammals
    1. Young develop inside the mother in the placenta
    2. Placenta attaches the baby to the mother via a cord
        a) Provides nourishment
        b) Removes waste
    3. Born developed to function and survive well in the word
    4. Examples: humans (made in the image of God), horses, dogs, cats
B. Marsupials
    1. Young develop inside the mother in the placenta for a few days
    2. Born vulnerable and need time to develop
    3. Young crawls into mother's pouch continuing to grow and gain nourishment
    4. Once fully developed, detach from their mothers and enter the world
    5. Examples: kangaroos, koalas, opossums
C. Monotremes
    1. Lay eggs with hard shells that nourish the baby
    2. Mother cares for eggs until they hatch
    3. Once hatched, the mother produces milk for the babies via mammary glands
    4. Examples: duck-billed platypus, long-beaked echidna, and short-beaked echidna