CK-12 Foundation

A. Biology: Glossary

Say Thanks to the Authors
Click http://www.ck12.org/saythanks
(No sign in required)

Brainard **SHUMOCK**

To access a customizable version of this book, as well as other interactive content, visit www.ck12.org

CK-12 Foundation is a non-profit organization with a mission to reduce the cost of textbook materials for the K-12 market both in the U.S. and worldwide. Using an open-content, web-based collaborative model termed the **FlexBook®**, CK-12 intends to pioneer the generation and distribution of high-quality educational content that will serve both as core text as well as provide an adaptive environment for learning, powered through the **FlexBook Platform®**.

Printed: August 22, 2011

flexbook
next generation textbooks

Authors
Jean Brainard, ELISABETH SHUMOCK

Contributor
ELISABETH SHUMOCK

Editor
Douglas Wilkin

Contents

Chapter 1

A. Biology: Glossary

(*Opening image copyright by Stephen Aaron Rees, 2010. Used under license from Shutterstock.com.*)

1.1 A

abiotic factor nonliving aspect of the environment such as sunlight and soil

absolute dating carbon-14 or other method of dating fossils that gives an approximate age in years

absorption process in which substances such as nutrients pass into the blood stream

acid solution with a pH lower than 7

acid rain low-pH precipitation that forms with air pollution combines with water

acquired immunodeficiency syndrome (AIDS) disorder characterized by frequent opportunistic infections that eventually develops in people who are infected with human immunodeficiency virus (HIV)

action potential reversal of electrical charge across the membrane of a resting neuron that travels down the axon of the neuron as a nerve impulse

activation energy energy needed to start a chemical reaction

active immunity ability to resist a pathogen that results when an immune response to the pathogen produces memory cells

active transport movement of substances across a plasma membrane that requires energy

adaptation characteristic that helps living things survive and reproduce in a given environment

adaptive radiation process by which a single species evolves into many new species to fill available niches

adolescence period of transition between the beginning of puberty and adulthood during which significant physical, mental, emotional, and social changes occur

adolescent growth spurt period of rapid growth that occurs during puberty

adrenal glands pair of endocrine glands located above the kidneys that secrete hormones such as cortisol and adrenaline

aerobic respiration type of cellular respiration that requires oxygen

age-sex structure number of individuals of each sex and age in a population

aggression behavior that is intended to cause harm or pain

air pollution chemical substances and particles released into the air mainly by human actions such as burning fossil fuels

Air Quality Index (AQI) assessment of the levels of pollutants in the outdoor air that is based on their human health effects

alcoholic fermentation type of anaerobic respiration that includes glycolysis followed by the conversion of pyruvic acid to ethanol and carbon dioxide and the formation of NAD^+

algae (singular, alga) plant-like protists such as diatoms and seaweeds

algal bloom excessive growth of algae in bodies of water because of high levels of nutrients, usually from fertilizer in runoff

allele one of two or more different versions of the same gene

allele frequency how often an allele occurs in a gene pool relative to the other alleles for that gene

allergen any antigen that causes an allergy

allergy disease in which the immune system makes an inflammatory response to a harmless antigen

allopatric speciation evolution of a new species that occurs when some members of an original species become geographically separated from the rest of the species

alternation of generations change back and forth from one generation to the next between haploid gametophyte and diploid sporophyte stages in the life cycle of plants

alveoli (singular, alveolus) tiny sacs at the ends of bronchioles in the lungs where pulmonary gas exchange takes place

amoeboid type of protozoa, such as *Amoeba,* that moves with pseudopods

amino acid small molecule that is a building block of proteins

amniote animal that produces eggs with internal membranes that allow gases but not water to pass through so the embryo can breathe without drying out (reptile, bird, or mammal)

amniotic sac enclosed membrane containing fluid that surrounds and protects a fetus

amphibian ectothermic, tetrapod vertebrate that may live on land but must return to water in order to reproduce

anabolic reaction endothermic reaction in organisms

anaerobic respiration type of cellular respiration that does not require oxygen

analogous structure structure that is similar in unrelated organisms because it evolved to do the same job, not because it was inherited from a common ancestor

anaphase third phase of mitosis during which sister chromatids separate and move to opposite poles of the cell

angiosperm type of seed plant that produces seeds in the ovary of a flower

animal heterotrophic, multicellular eukaryote with cells that lack cell walls; member of the animal kingdom

animal behavior any way that animals interact with each other or the environment

Annelida invertebrate phylum of segmented worms such as earthworms

antheridia (singular, antheridium) male reproductive organs of the gametophyte generation of plants that produce motile sperm

antibiotic drug drug that kills bacteria and cures bacterial infections and diseases

antibiotic resistance ability to withstand antibiotic drugs that has evolved in some bacteria

antibody large, Y-shaped proteins produced by B cells that recognize and bind to antigens in a humoral immune response

antigen molecule that the immune system identifies as foreign and responds to by forming antibodies

aphotic zone area in aquatic biomes deeper than 200 meters

aquatic biome water-based biomes, defined by the availability of sunlight and the concentration of dissolved oxygen and nutrients in the water

aquifer underground layer of rock that stores water

arboreal of or pertaining to trees, as in arboreal, or tree-living, mammal

Archaea one of two prokaryote domains that includes organisms that live in extreme environments

archegonia (singular, archegonium) female reproductive organs of the gametophyte generation of plants that produce eggs

artery type of blood vessel that carries blood away from the heart toward the lungs or body

arthropod invertebrate in the phylum Arthropoda, characterized by a segmented body, hard exoskeleton, and jointed appendages

artificial selection process in which organisms evolve traits useful to humans because people select which individuals are allowed to reproduce and pass on their genes to successive generations

asexual reproduction reproduction that involves a single parent and results in offspring that are all genetically identical to the parent

asthma respiratory system disease in which air passages of the lungs periodically become too narrow, making breathing difficult

atherosclerosis condition in which plaque builds up inside arteries

athlete's foot infection of the skin between the toes by the fungus *Trichophyton*

ATP (adenosine triphosphate) energy-carrying molecule that cells use to power their metabolic processes

autoimmune disease type of disease, such as type 1 diabetes, in which the immune system attacks the body's cells as though they were pathogens

autonomic nervous system (ANS) division of the peripheral nervous system that controls involuntary activities not under conscious control such as heart rate and digestion

autosome chromosomes 1–22 in humans that contain genes for characteristics unrelated to sex

autotroph organism that makes its own food

axon long extension of the cell body of a neuron that transmits nerve impulses to other cells

1.2 B

Bacteria domain of prokaryotes, some of which cause human diseases

bark tissue that provides a rough, woody external covering on the stems of trees

base solution with a pH higher than 7

B cell type of lymphocyte that fights infections by forming antibodies

bilateral symmetry symmetry of a body plan in which there are distinct head and tail ends, so the body can be divided into two identical right and left halves

bile fluid produced by the liver and stored in the gall bladder that is secreted into the small intestine to help digest lipids and neutralize acid from the stomach

binary fission type of cell division that occurs in prokaryotic cells in which a parent cells divides into two identical daughter cells

binomial nomenclature method of naming species with two names, consisting of the genus name and species name

biochemical reaction chemical reaction that occurs inside the cells of living things

biodiversity the variety of life and its processes; including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur

biofilm colony of prokaryotes that is stuck to a surface such as a rock or a host's tissue

biogeochemical cycle interconnected pathways through which water or a chemical element such as carbon is continuously recycled through the biotic and abiotic components of the biosphere

biogeography study of how and why plants and animals live where they do

biology science of life, study of life

biomass total mass of organisms at a trophic level

biome group of similar ecosystems with the same general type of physical environment

biosphere part of Earth where all life exists, including land, water, and air

biotechnology use of technology to change the genetic makeup of living things in order to produce useful products

bioterrorism intentional release or spread of agents of disease

biotic factor living aspects of the environment, including organisms of the same and different species

bird bipedal, endothermic, tetrapod vertebrate that lays amniotic eggs and has wings and feathers

bladder hollow, sac-like organ that stores urine until it is excreted from the body

blastocyst fluid-filled ball of cells that develops a few days after fertilization in humans

blood fluid connective tissue that circulates throughout the body through blood vessels

blood pressure force exerted by circulating blood on the walls of blood vessels

blood type genetic characteristic associated with the presence or absence of antigens on the surface of red blood cells

body mass index (BMI) estimate of the fat content of the body calculated by dividing a person's weight (in kilograms) by the square of the person's height (in meters)

bone hard tissue in most vertebrates that consists of a collagen matrix, or framework, filled in with minerals such a calcium

bone marrow soft connective tissue in spongy bone that produces blood cells

bone matrix rigid framework of bone that consists of tough protein fibers and mineral crystals

brain central nervous system organ inside the skull that is the control center of the nervous system

brain stem lowest part of the brain that connects the brain with the spinal cord and controls unconscious functions such as heart rate and breathing

bryophyte type of plant that lacks vascular tissues, such as a liverwort, hornwort, or moss

budding type of asexual reproduction in yeasts in which an offspring cell pinches off from the parent cell

1.3 C

Calvin cycle second stage of photosynthesis in which carbon atoms from carbon dioxide are combined, using the energy in ATP and NADPH, to make glucose

Cambrian explosion spectacular burst of new life that occurred at the start of the Paleozoic Era

cancer disease that occurs when the cell cycle is no longer regulated and cells divide out of control

candidiasis infection of the mouth or of the vagina in females that is caused by the yeast *Candida*

capillary smallest type of blood vessel that connects very small arteries and veins

capsid protein coat that surrounds the DNA or RNA of a virus particle

carbohydrate organic compound such as sugar or starch

carbon cycle interconnected pathways through which carbon is recycled through the biotic and abiotic components of the biosphere

carcinogen anything that can cause cancer

cardiac muscle involuntary, striated muscle found only in the walls of the heart

cardiovascular disease (CVD) any disease that affects the heart or blood vessels

carnivore consumer that eats animals

carrying capacity (K) largest population size that can be supported in an area without harming the environment

cartilage dense connective tissue that provides a smooth surface for the movement of bones at joints

catabolic reaction exothermic reaction in organisms

cell basic unit of structure and function of living things

cell body central part of a neuron that contains the nucleus and other cell organelles

cell cycle repeating series of events that a cell goes through during its life, including growth, DNA, synthesis, and cell division

cell division process in which a parent cell divides to form two daughter cells

cell-mediated immune response type of immune response in which T cells destroy cells that are infected with viruses

cell theory theory that all living things are made up of cells, all life functions occur within cells, and all cells come from already existing cells

cellular respiration process in which cells break down glucose and make ATP for energy

cell wall rigid layer that surrounds the plasma membrane of a plant cell and helps support and protect the cell

Cenozoic Era age of mammals that lasted from 65 million years ago to the present

central dogma of molecule biology doctrine that genetic instructions in DNA are copied by RNA, which carries them to a ribosome where they are used to synthesize a protein (DNA $\rightarrow$ RNA $\rightarrow$ protein)

central nervous system (CNS) one of two main divisions of the nervous system that includes the brain and spinal cord

central vacuole large saclike organelle in plant cells that stores substances such as water and helps keep plant tissues rigid

centromere region of sister chromatids where they are joined together

cephalization concentration of nerve tissue in one end of an animal, forming a head region

cerebellum part of the brain below the cerebrum that coordinates body movements

cerebrum largest part of the brain that controls conscious functions such as reasoning and sight

Chargaff's rules observations by Erwin Chargaff that concentrations of the four nucleotide bases differ among species; and that, within a species, the concentrations of adenine and thymine are always about the same and the concentrations of cytosine and guanine are always about the same

chemical bond force that holds molecules together

chemical digestion chemical breakdown of large, complex food molecules into smaller, simpler nutrient molecules that can be absorbed by the blood

chemical reaction process that changes some chemical substances into others

chemoautotroph producer that uses energy from chemical compounds to make food by chemosynthesis

chemosynthesis process of using the energy in chemical compounds to make food

chitin tough carbohydrate that makes up the cell walls of fungi and the exoskeletons of insects and other arthropods

chlamydia sexually transmitted bacterial infection that is the most common STI in the United States

chlorophyll green pigment in a chloroplast that absorbs sunlight in the light reactions of photosynthesis

chloroplast organelle in the cells of plants and algae where photosynthesis takes place

chordates consists of all animals with a notochord, dorsal hollow nerve cord, post-anal tail, and pharyngeal slits during at least some stage of their life

chromatid one of two identical copies of a chromosome that are joined together at a centromere before a cell divides

chromatin grainy material that DNA forms when it is not coiled into chromosomes

chromosomal alteration mutation that changes chromosome structure

chromosome coiled structure made of DNA and proteins containing sister chromatids that is the form in which the genetic material of a cell goes through cell division

cilia (singular, cilium) short, hairlike projections, similar to flagella, that allow some cells to move

ciliate type of protozoa, such as *Paramecium,* that moves with cilia

circadian rhythm regular change in biology or behavior that occurs in a 24-hour cycle

circulatory system organ system consisting of the heart, blood vessels, and blood that transports materials around the body

clade group of related organisms that includes an ancestor and all of its descendants

climate average weather in an area over a long period of time

climax community final stable stage of ecological succession that may be reached in an undisturbed community

cloaca body cavity with a single opening in amphibians, reptiles, and monotreme mammals that collects and excretes wastes from the digestive and excretory systems and gametes from the reproductive system

Cnidaria invertebrate phylum that includes animals such as jellyfish and corals that are characterized by radial symmetry, tissues, and a stinger called a nematocyst

codominance relationship between two alleles for the same gene in which both alleles are expressed equally in the phenotype of the heterozygote

codon group of three nitrogen bases in nucleic acids that makes up a code "word" of the genetic code and stands for an amino acid, start, or stop

coelom fluid-filled body cavity

coevolution process in which two interacting species evolve together, with each species influencing the other's evolution

commensalism symbiotic relationship in which one species benefits while the other species is not affected

community all of the populations of different species that live in the same area

compact bone dense outer layer of bone that is very hard and strong

comparative anatomy study of the similarities and differences in the structures of different species

comparative embryology study of the similarities and differences in the embryos of different species

competition relationship between living things that depend on the same resources in the same place and at the same time

competitive exclusion principle principle of ecology stating that two different species cannot occupy the same niche in the same place for very long

complementary base pair pair of nucleotide bases that bond together—either adenine and thymine (or uracil) or cytosine and guanine

complete digestive system digestive system consisting of a digestive tract and two body openings (mouth and anus)

compound substance with a unique, fixed composition that consists of two or more elements

condensation process in which water vapor changes to tiny droplets of liquid water

cone structure consisting of scales that bear naked seeds in the type of seed plants called gymnosperms

connective tissue tissue made up of cells that form the body's structure, such as bone and cartilage

consumer organism that consumes other organisms for food

cooperation type of animal behavior in which social animals live and work together for the good of the group

courtship animal behavior that is intended to attract a mate

cranium part of a vertebrate endoskeleton that encloses and protects the brain; also called the skull

crop sac-like structure in the digestive system of birds that stores and moistens food before it is digested

crossing-over exchange of genetic material between homologous chromosomes when they are closely paired during meiosis I

cuticle waxy, waterproof substance produced by epidermal cells of leaves, shoots, and other above-ground parts of plants to preven damage and loss of water by evaporation

cyanobacteria Gram-positive blue-green photosynthetic bacteria of the type that added oxygen to Earth's early atmosphere and evolved into chloroplasts of eukaryotic cells

cytokinesis splitting of the cytoplasm to form daughter cells when a cell divides

cytoplasm all of the material inside the plasma membrane of a cell (excluding organelles)

cytoskeleton structure of filaments and tubules in the cytoplasm that provides a cell with an internal framework

1.4 D

dead zone area in the ocean or other body of water where low oxygen levels from excessive growth of algae have killed all aquatic organisms

deciduous plant type of plant that seasonally loses its leaves to reduce water loss during the cold or dry season each year and grows new leaves later in the year

decomposer organism that breaks down the remains of dead organisms and other organic wastes

demographic transition changes in population that occurred in Europe and North America beginning in the 18^{th} century, in which death rates fell and population growth rates increased, followed by birth rates falling and population growth rates decreasing

dendrite extension of the cell body of a neuron that receives nerve impulses from other neurons

dependent variable variable in a scientific experiment that is affected by another variable, called the independent variable

deposit feeder animal that obtains organic matter for nutrition by eating soil or the sediments at the bottom of a body of water

dermal tissue type of plant tissue that covers the outside of a plant in a single layer of cells called the epidermis

dermis lower layer of the skin that is made of tough connective tissue and contains blood vessels, nerve endings, hair follicles, and glands

detritivore decomposer that consumes detritus

detritus substance composed of dead leaves, other plant remains, and animal feces that collects on the soil or at the bottom of a body of water

dialysis medical procedure in which blood is filtered through a machine in patients with kidney failure

diaphragm large, sheet-like muscle below the lungs that allows breathing to occur when it contracts and relaxes

differentiation process by which unspecialized cells become specialized into one of many different types of cells, such as neurons or epithelial cells

diffusion type of passive transport that does not require the help of transport proteins

digestion process of breaking down food into nutrients that can be absorbed by the blood

digestive system organ system that breaks down food, absorbs nutrients, and eliminates any remaining waste

diploid having two of each type of chromosome

directional selection type of natural selection for a polygenic trait in which one of two extreme phenotypes is selected for, resulting in a shift of the phenotypic distribution toward that extreme

dispersal movement of offspring away from their parents

disruptive selection type of natural selection for a polygenic trait in which phenotypes in the middle of the phenotypic distribution are selected against, resulting in two overlapping phenotypes, one at each end of the distribution

DNA (deoxyribonucleic acid) double-stranded nucleic acid that makes up genes and chromosomes

DNA replication process of copying of DNA prior to cell division

domain taxon in the revised Linnaean system that is larger and more inclusive than the kingdom

dominant allele allele that masks the presence of another allele for the same gene when they occur together in a heterozygote

dormancy state in which a plant slows down cellular activity and may shed its leaves

double helix double spiral shape of the DNA molecule

drug abuse use of a drug without the advice of a medical professional and for reasons not originally intended

drug addiction situation in which a drug user is unable to stop using a drug

1.5 E

eating disorder mental illness in which people feel compelled to eat in a way that causes physical, mental, and emotional health problems

echinoderms invertebrates such as sea stars and sand dollars that are characterized by a spiny endoskeleton, radial symmetry as adults, and a water vascular system

ecological succession changes through time in the numbers and types of species that make up the community of an ecosystem

ecology branch of biology that is the study of how living things interact with each other and with their environment

ecosystem all the living things in a given area together with the physical factors of the nonliving environment

ectoderm outer embryonic cell layer in animals

ectothermy regulation of body temperature from the outside through behavioral changes such as basking in the sun

egg female gamete

ejaculation muscle contractions that propel sperm from the epididymes and out through the urethra in males

electron transport chain series of electron-transport molecules that pass high-energy electrons from molecule to molecule and capture their energy

element pure substance that cannot be broken down into other types of substances

elimination process in which waste passes out of the body

embryo stage of growth and development that occurs from implantation through the eighth week after fertilization in humans

emigration movement of individuals out of a population

emphysema lung disease, usually caused by smoking, in which walls of alveoli break down, so less gas can be exchanged in the lungs

endocrine system human body system of glands that release hormones into the blood

endocytosis type of vesicle transport that moves substances into a cell

endoderm inner embryonic cell layer in animals

endoplasmic reticulum (ER) organelle in eukaryotic cells that helps make and transport proteins

endoskeleton internal skeleton that provides support and protection

endosperm stored food inside a plant seed

endospore spores that form inside prokaryotic cells when they are under stress, enclosing the DNA and helping it survive conditions that may kill the cell

endosymbiotic theory theory that eukaryotic organelles such as mitochondria evolved from ancient, free-living prokaryotes that invaded primitive eukaryotic cells

endothermic reaction chemical reaction that absorbs energy

endothermy regulation of body temperature from the inside through metabolic or other physical changes

energy ability to do work

enzyme protein that speeds up biochemical reactions

epidermis outer layer of skin that consists mainly of epithelial cells and lacks nerve endings and blood vessels

epididymis (plural, epididymes) one of two male reproductive organs where sperm mature and are stored until they leave the body

epiphyte plant that is adapted to grow on other plants and obtain moisture from the air

epistasis situation in which one gene affects the expression of another gene

epithelial tissue tissue made up of cells that line inner and outer body surfaces, such as skin

esophagus long, narrow digestive organ that passes food from the pharynx to the stomach

estrogen female sex hormone secreted by the ovaries

estuary a partly enclosed coastal body of water with one or more rivers or streams flowing into it, and with a free connection to the ocean

ethology branch of biology that studies animal behavior

eukaryote organism that has cells containing a nucleus and other organelles

eukaryotic cell cell that contains a nucleus and other organelles

evaporation process in which liquid water changes to water vapor

evergreen plant type of plant that keeps its leaves and stays green year-round

evidence any type of data that may be used to test a hypothesis

evolution change in the characteristics of living things over time, the change in species over time

exchange pool part of a biogeochemical cycle that holds an element or water for a short period of time

excretion process of removing wastes and excess water from the body

excretory system organ system that removes wastes and excess water from the body and includes the kidneys, large intestine, liver, skin, and lungs

exocytosis type of vesicle transport that moves substances out of a cell

exoskeleton non-bony skeleton that forms on the outside of the body of some invertebrates and provides protection and support

exothermic reaction chemical reaction that releases energy

exotic species species that is introduced (usually by human actions) into a new habitat where it may lack local predators and out-compete native species

experiment special type of scientific investigation that is performed under controlled conditions

exponential growth pattern of population growth in which a population starts out growing slowly but grows faster and faster as population size increases

extinction situation in which a species completely dies out and no members of the species remain

extremophile any type of Archaea that lives in an extreme environment, such as a very salty, hot, or acidic environment

1.6 F

facilitated diffusion diffusion with the help of transport proteins

Fallopian tube one of two female reproductive organs that carry eggs from the ovary to the uterus and provide the site where fertilization usually takes place

feces solid waste that remains after food is digested and is eliminated from the body through the anus

fermentation type of anaerobic respiration that includes glycolysis followed by the conversion of pyruvic acid to one or more other compounds and the formation of NAD^+

fertilization union of two gametes that produces a diploid zygote

fetus developing human organism between weeks 8 and 38 after fertilization

fibrous root threadlike root that makes up part of the fibrous root system of some plants

filter feeder animal that obtains organic matter for nutrition by filtering particles out of water

fish ectothermic, aquatic vertebrate with a streamlined body and gills for absorbing oxygen from water

fitness relative ability of an organism to survive and produce fertile offspring

flagella (singular, flagellum) long, thin protein extensions of the plasma membrane in most prokaryotic cells that help the cells move

flagellate type of protozoa, such as *Giardia,* that moves with flagella

flower structure in angiosperms consisting of male and female reproductive structures that attracts animal pollinators

follicle-stimulating hormone (FSH) pituitary gland hormone that stimulates the ovaries to secrete estrogen and follicles in the ovaries to mature

food organic molecules such as glucose that organisms use for chemical energy

food chain diagram that represents a single pathway through which energy and matter flow through an ecosystem

food web diagram that represents multiple intersecting pathways through which energy and matter flow through an ecosystem

fossil preserved remains or traces of organisms that lived in the past

fossil record the record of life as told by the study and analysis of fossils

frameshift mutation deletion or insertion of one or more nucleotides that changes the reading frame of the genetic material

freshwater biome aquatic biome such as a pond, lake, stream, or river in which the water contains little or no salt

fruit structure in many flowering plants that develops from the ovary and contains seeds

fungi (singular, fungus) kingdom in the domain Eukarya that includes molds, mushrooms, and yeasts

1.7 G

Galápagos Islands group of 16 small volcanic islands in the Pacific Ocean 966 kilometers (600 miles) off the west coast of South America, where Darwin made some of his most important observations during his voyage on the *HMS Beagle*

gall bladder sac-like organ that stores bile from the liver and secretes it into the duodenum of the small intestine

gamete reproductive cell produced during meiosis that has the haploid number of chromosomes

gametogenesis development of haploid cells into gametes such as sperm and egg

gametophyte haploid generation in the life cycle of a plant that results from asexual reproduction with spores and that produces gametes for sexual reproduction

gastrointestinal (GI) tract organs of the digestive system through which food passes during digestion, including the mouth, esophagus, stomach, and small and large intestines

gene unit of DNA on a chromosome that is encoded with the instructions for a single protein

gene cloning process of isolating and making copies of a gene

gene expression use of a gene to make a protein

gene flow change in allele frequencies that occurs when individuals move into or out of a population

gene pool all the genes of all the members of a population

generalist organism that can consume many different types of food

gene theory theory that the characteristics of living things are controlled by genes that are passed from parents to offspring

gene therapy way to cure genetic disorders by inserting normal genes into cells with mutant genes

genetic code universal code of three-base codons that encodes the genetic instructions for the amino acid sequence of proteins

genetic disorder disease caused by a mutation in one or a few genes

genetic drift a random change in allele frequencies that occurs in a small population

genetic engineering using biotechnology to change the genetic makeup of an organism

genetics the science of heredity

genetic trait characteristic that is encoded in DNA

genetic transfer method of increasing genetic variation in prokaryotes that involves cells ‘‘grabbing” stray pieces of DNA from their environment or exchanging DNA directly with other cells

genital herpes sexually transmitted infection caused by a herpes virus that is characterized by periodic outbreaks of blisters on the genitals

genital warts small, rough growths on the genitals caused by a sexually transmitted infection with human papillomavirus (HPV)

genotype alleles an individual inherits at a particular genetic locus

genus taxon above the species in the Linnaean classification system; group of closely related species

geologic time scale time line of Earth based on major events in geology, climate, and the evolution of life

germination early growth and development of a plant embryo in a seed

germline mutation mutation that occur in gametes

giardiasis disease caused by *Giardia* protozoa that spreads through contaminated food or water

gills organs in aquatic organisms composed of thin filaments that absorb oxygen from water

gizzard food-grinding organ in the digestive system of birds and some other animals that may contain swallowed stones

global warming recent rise in Earth's average surface temperature generally attributed to an increased greenhouse effect

glucose simple carbohydrate with the chemical formula $C_6H_{12}O_6$ that is the nearly universal food for life

glycolysis first stage of cellular respiration in which glucose is split, in the absence of oxygen, to form two molecules of pyruvate (pyruvic acid) and two (net) molecules of ATP

Golgi apparatus organelle in eukaryotic cells that processes proteins and prepares them for use both inside and outside the cell

gonads glands that secrete sex hormones and produce gametes; testes in males and ovaries in females

gonorrhea common sexually transmitted infection that is caused by bacteria

gradualism model of the timing of evolution in which evolutionary change occurs at a slow and steady pace

Gram-negative bacteria type of bacteria that stain red with Gram stain and have a thin cell wall with an outer membrane

Gram-positive bacteria type of bacteria that stain purple with Gram stain and have a thick cell wall without an outer membrane

grana within the chloroplast, consists of sac-like membranes, known as thylakoid membranes

greenhouse effect natural feature of Earth's atmosphere that occurs when gases in the atmosphere radiate the sun's heat back down to Earth's surface, making Earth's temperature far warmer than it otherwise would be

ground tissue type of plant tissue making up most of the interior of the roots and stems of plants that carries out basic metabolic functions and provides support and storage

groundwater water that exists in the ground either in the soil or in rock layers below the surface

growing season period of time each year when it is warm enough and wet enough for plants to grow

gymnosperm type of seed plant that produces bare seeds in cones

1.8 H

habitat physical environment in which a species lives and to which it has become adapted

habitat loss destruction or disruption of Earth's natural habitats, most often due to human actions such as agriculture, forestry, mining, and urbanization

hair follicle structure in the dermis of skin where a hair originates

haploid having only one chromosome of each type

Hardy-Weinberg theorem founding principle of population genetics that proves allele and genotype frequencies do not change in a population that meets the conditions of no mutation, no migration, large population size, random mating, and no natural selection

heart muscular organ in the chest that that pumps blood through blood vessels when it contracts

heart attack blockage of blood flow to heart muscle tissues that may result in the death of cardiac muscle fibers

hepatitis B inflammation of the liver caused by infection with hepatitis B virus, which is often transmitted through sexual contact

herbivore consumer that eats producers such as plants or algae

heterotroph organism that gets food by consuming other organisms

heterozygote organism that inherits two different alleles for a given gene

homeobox gene gene that codes of regulatory proteins that control gene expression during development

homeostasis process of maintaining a stable environment inside a cell or an entire organism

homologous chromosomes pair of chromosomes that have the same size and shape and contain the same genes

homologous structure structure that is similar in related organisms because it was inherited from a common ancestor

homozygote organism that inherits two alleles of the same type for a given gene

host species that is harmed in a parasitic relationship

human genome all of the DNA of the human species

Human Genome Project international science project that sequenced all 3 billion base pairs of the human genome

human immunodeficiency virus (HIV) virus transmitted through body fluids that infects and destroys helper T cells and eventually causes acquired immunodeficiency syndrome (AIDS)

human papilloma virus (HPV) sexually transmitted virus that causes genital warts and cervical cancer

humoral immune response type of immune response in which B cells produce antibodies against antigens in blood and lymph

hybrid offspring that results from a cross between two different types of parents

hydrogen bond type of chemical bond that forms between molecules: found between water molecules

hydrostatic skeleton type of internal support in an animal body that results from the pressure of fluid within the body cavity known as the coelom

hypertension high blood pressure

hyphae (singular, hypha) thread-like filaments that make up the body of a fungus and consist of one or more cells surrounded by a tubular cell wall

hypothalamus part of the brain that secretes hormones

hypothesis possible answer to a scientific question; must be falsifiable

1.9 I

immigration movement of individuals into a population

immune response specific defense against a particular pathogen

immune system body system that consists of skin, mucous, membranes, and other tissues and organs that defends the body from pathogens and cancer

immunity ability to resist a pathogen due to memory lymphocytes or antibodies to the antigens the pathogen carries

immunization deliberate exposure of a person to a pathogen in order to provoke an immune response and the formation of memory cells specific to that pathogen

immunodeficiency inability of the immune system to fight off pathogens that a normal immune system would be able to resist

implantation process in which a blastocyst embeds in the endometrium lining the uterus

incomplete digestive system digestive system that consists of a digestive cavity and a single opening that serves as both mouth and anus

incomplete dominance relationship between the alleles for a gene in which one allele is only partly dominant to the other allele so an intermediate phenotype results

incubation period of bird reproduction when one or both parents sit on, or brood, the eggs in order to keep them warm until they hatch

independent assortment independent segregation of chromosomes to gametes during meiosis

independent variable variable in a scientific experiment that is manipulated by the researcher to investigate its affect on another variable, called the dependent variable

infancy first year of life after birth in humans

inflammatory response nonspecific response the body first makes to tissue damage or infection

inheritance of acquired characteristics mistaken idea of Jean Baptiste Lamarck that evolution occurs through the inheritance of traits that an organism develops in its own life time

innate behavior behavior closely controlled by genes that occurs naturally, without learning or practice, in all members of a species whenever they are exposed to a certain stimulus; also called instinctive behavior

instinct ability of an animal to perform a behavior the first time it is exposed to the proper stimulus

integumentary system human body system that includes the skin, nails, and hair

interneuron type of neuron that carries nerve impulses back and forth between sensory and motor neurons

interphase stage of the eukaryotic cell cycle when the cell grows, synthesizes DNA, and prepares to divide

interspecific competition relationship between organisms of different species that strive for the same resources in the same place

intertidal zone in marine biomes, the narrow strip along the coastline that is covered by water at high tide and exposed to air at low tide

intraspecific competition relationship between organisms of the same species that strive for the same resources in the same place

invertebrate animal that lacks a vertebral column, or backbone

1.10 J

joint place where two or more bones of the skeleton meet

1.11 K

kelp multicellular seaweed that may grow as large as a tree and occurs in forests found throughout the ocean in temperate and arctic climates

keratin tough, fibrous protein in skin, nails, and hair

keystone species species that plays an especially important role in its community so that major changes in its numbers affect the populations of many other species in the community

kidney main organ of the excretory system that filters blood and forms urine

kidney failure loss of the ability of nephrons of the kidney to function fully

kingdom largest and most inclusive taxon in the original Linnaean classification system

Krebs cycle second stage of aerobic respiration in which two pyruvate (pyruvic acid) molecules from the first stage react to form ATP, NADH, and $FADH_2$

***K*-selected** species in which population growth is controlled by density-dependent factors and population size is generally at or near carrying capacity

1.12 L

lactation production of milk for an offspring by mammary glands, which occurs in all female mammals after giving birth or laying eggs

lactic acid fermentation type of anaerobic respiration that includes glycolysis followed by the conversion of pyruvic acid to lactic acid and the formation of NAD^+

lancelets members of the subphylum Cephalochordata

large intestine organ of the digestive system that removes water from food waste and forms feces

larva (plural, larvae) juvenile stage that occurs in the life cycle of many invertebrates, fish, and amphibians and that differs in form and function from the adult stage

larynx organ of the respiratory system between the pharynx and trachea that is also called the voice box because it allows the production of vocal sounds

last universal common ancestor (LUCA) hypothetical early cell (or group of cells) that gave rise to all subsequent life on Earth

latency period of dormancy of a virus inside a living body that may last for many years

law of independent assortment Mendel's second law stating that factors controlling different characteristics are inherited independently of each other

law of segregation Mendel's first law stating that the two factors controlling a characteristics separate and go to different gametes

learning change in behavior that occurs as a result of experience

leukocyte white blood cell produced by bone marrow to fight infections

lichen mutualistic relationship between a fungus and a cyanobacterium or green alga

life cycle series of stages a sexually reproducing organism goes through from one generation to the next

ligament band of fibrous connective tissue that holds bones together

light reactions first stage of photosynthesis in which light energy from the sun is captured and changed into chemical energy that is stored in ATP and NADPH

lignin tough, hydrophobic carbohydrate molecule that stiffens and waterproofs vascular tissues of plants

linkage map map that shows the positions of genes on a chromosome based on the frequency of crossing-over between the genes

linked genes genes that are located on the same chromosome

Linnaean classification system system of classifying organisms based on observable physical traits; consists of a hierarchy of taxa, fro the kingdom to the species

lipid organic compound such as fat or oil

liver organ of digestion and excretion that secretes bile for lipid digestion and breaks down excess amino acids and toxins in the blood

locus position of a gene on a chromosome

logistic growth pattern of population growth in which growth slows and population size levels off as the population approaches the carrying capacity

lung organ of the respiratory system in which gas exchange takes place between the blood and the atmosphere

luteinizing hormone (LH) pituitary gland hormone that stimulates the testes to secrete testosterone and the ovaries to secrete estrogen

lymph fluid that leaks out of capillaries into spaces between cells and circulates in the vessels of the lymphatic system

lymphatic system system of the body consisting of organs, vessels, nodes, and lymph that produces lymphocytes and filters pathogens from body fluids

lymph node small structures located on lymphatic vessels where pathogens are filtered from lymph and destroyed by lymphocytes

lymphocyte type of leukocyte that is a key cell in the immune response to a specific pathogen

1.13 M

macroevolution evolutionary change that occurs over geologic time above the level of the species

macronutrient nutrient such as carbohydrates, proteins, lipids, or water that is needed by the body in relatively large amounts

malaria disease caused by *Plasmodium* protozoa and transmitted by mosquitoes in tropical and subtropical regions of the world

mammal endothermic, tetrapod vertebrate that lays amniotic eggs and has mammary glands (in females) and hair or fur

mammary gland gland in female mammals that produces milk for offspring

mantle layer of tissue that lies between the shell and body of a mollusk and forms a cavity, called the mantle cavity, that pumps water for filter feeding

marine biome aquatic biome in the salt water of the ocean

marsupial therian mammal in which the embryo is born at an early, immature stage and completes its development outside the mother's body in a pouch on her belly

mass extinction extinction event in which many if not most species abruptly disappear from Earth

matter anything that takes up space and has mass

mechanical digestion physical breakdown of chunks of food into smaller pieces by organs of the digestive system

medusa (plural, medusae) basic body plan in cnidarians such as jellyfish that is bell-shaped and typically motile

meiosis type of cell division in which the number of chromosomes is reduced by half and four haploid cells result

melanin brown pigment produced by melanocytes in the skin that gives skin most of its color and prevents UV light from penetrating the skin

memory cell lymphocyte (B or T cell) that retains a ''memory" of a specific pathogen after an infection is over and thus provides immunity to the pathogen

menarche beginning of menstruation; first monthly period in females

menopause period during which menstrual cycles slow down and eventually stop in middle adulthood

menstrual cycle monthly cycle of processes and events in the ovaries and uterus of a sexually mature human female

menstruation process in which the endometrium of the uterus is shed from the body during the first several days of the menstrual cycle; also called monthly period

meristem type of plant tissue consisting of undifferentiated cells that can continue to divide and differentiate and from which plants grow in length or width

mesoderm embryonic cell layer in many animals that is located between the endoderm (inner cell layer) and ectoderm (outer cell layer)

mesophyll specialized tissue inside plant leaves where photosynthesis takes place

Mesozoic Era age of dinosaurs that lasted from 245–65 million years ago

messenger RNA (mRNA) type of RNA that copies genetic instructions from DNA in the nucleus and carries them to the cytoplasm

metabolism sum of all the biochemical reactions in an organism

metamorphosis process in which a larva undergoes a major transformation to change into the adult form, which occurs in amphibians, arthropods, and other invertebrates

metaphase second phase of mitosis during which chromosomes line up at the equator of the cell

microevolution evolutionary change that occurs over a relatively short period of time within a population or species

micronutrient nutrient such as a vitamin or mineral that is needed by the body in relatively small amounts

migration regular movement of individuals or populations each year during certain seasons, usually to find food, mates, or other resources

mineral chemical element such as calcium or potassium that is needed in relatively small amounts for proper body functioning

mitochondria (singular, mitochondrion) organelle in eukaryotic cells that makes energy available to the cell in the form of ATP molecules

mitosis process in which the nucleus of a eukaryotic cell divides

model representation of part of the real world

molecular clock using DNA (or proteins) to measure how long it has been since related species diverged from a common ancestor

Mollusca phylum of invertebrates that are generally characterized by a hard outer shell, a mantle, and a feeding organ called a radula

molting process in which an animal sheds and replaces the outer covering of the body, such as the exoskeleton in arthropods

monosaccharide simple sugar such as glucose that is a building block of carbohydrates

monotreme type of mammal that reproduces by laying eggs

motility the ability to move

motor neuron type of neuron that carries nerve impulses from the central nervous system to muscles and glands

mucous membrane epithelial tissue that lines inner body surfaces and body openings and produces mucus

mucus slimy substance produced by mucous membranes that traps pathogens, particles, and debris

multiple allele trait trait controlled by one gene with more than two alleles

muscle fiber long, thin muscle cell that has the ability to contract, or shorten

muscle tissue tissue made up of cells that can contract; includes smooth, skeletal, and cardiac muscle tissue

muscular system human body system that includes all the muscles of the body

mutagen environmental factors that causes mutations

mutation change in the sequence of bases in DNA or RNA

mutualism type of symbiotic relationship in which both species benefit

mycelium body of a fungus that consists of a mass of threadlike filaments called hyphae

mycorrhiza mutualistic relationship between a plant and a fungus that grows in or on its roots

myelin sheath lipid layer around the axon of a neuron that allows nerve impulses to travel more rapidly down the axon

MyPlate visual guideline for balanced eating, replacing MyPyramid in 2011

MyPyramid visual dietary guideline that shows the relative amounts of foods in different food groups that should be eaten each day

1.14 N

natural resource something supplied by nature that helps support life

natural selection evolutionary process in which some living things produce more offspring than others so the characteristics of organisms change over time

nature-nurture debate debate over the extent to which genes (nature) or experiences in a given environment (nurture) control traits such as animal behaviors

nectar sweet, sugary liquid produced by the flowers of many angiosperms to attract animal pollinators

Nematoda phylum of invertebrates called roundworms, which have a pseudocoelom and complete digestive system

neocortex layer of nerve cells covering the cerebrum of the mammalian brain that plays an important role in many complex brain functions

nephron structural and functional unit of the kidney that filters blood and forms urine

nerve one of many cable-like bundles of axons that make up the peripheral nervous system

nerve impulse electrical signal transmitted by the nervous system

nervous system human body system that carries electrical messages throughout the body

nervous tissue tissue made up of neurons, or nerve cells, that carry electrical messages

neuron nerve cell; structural and functional unit of the nervous system

neurotransmitter chemical that carries a nerve impulse from one nerve to another at a synapse

niche role of a species in its ecosystem that includes all the ways the species interacts with the biotic and abiotic factors of the ecosystem

nitrogen cycle interconnected pathways through which nitrogen is recycled through the biotic and abiotic components of the biosphere

nitrogen fixation process of changing nitrogen gas to nitrates that is carried out by nitrogen-fixing bacteria in the soil or in the roots of legumes

nondisjunction failure of replicated chromosomes to separate during meiosis II, resulting in some gametes with a missing chromosome and some with an extra chromosome

nonrenewable resource natural resource that exists in a fixed amount and can be used up

notochord stiff support rod that runs from one end of the body to the other in animals called chordates

nucleic acid organic compound such as DNA or RNA

nucleotide small molecule containing a sugar, phosphate group, and base that is a building block of nucleic acids

nucleus (plural, nuclei) organelle inside eukaryotic cells that contains most of the cell's DNA and acts as the control center of the cell

nutrient substance the body needs for energy, building materials, or control of body processes

1.15 O

obesity condition in which the body mass index is 30.0 kg/m^2 or greater

observation anything that is detected with the senses

omnivore consumer that eats both plants and animals

oogenesis process of producing eggs in the ovary

open circulatory system type of circulatory system in which blood flows not only through blood vessels but also through a body cavity

operator a region of an operon where regulatory proteins bind

operon region of prokaryotic DNA that consists of a promoter, an operator, and one or more genes that encode proteins needed for a specific function

organ structure composed of more than one type of tissue that performs a particular function

organelle structure within the cytoplasm of a cell that is enclosed within a membrane and performs a specific job

organic compound compound found in living things that contains mainly carbon

organism an individual living thing

organ system group of organs that work together to do a certain job

osmosis diffusion of water molecules across a membrane

ossification process in which mineral deposits replace cartilage and change it into bone

osteoblast type of bone cell that makes new bone cells and secretes collagen

osteoclast type of bone cell that dissolves minerals in bone and releases them back into the blood

osteocyte type of bone cell that regulates mineral homeostasis by directing the uptake of minerals from the blood and the release of minerals back into the blood as needed

ovary one of two female reproductive organs that produces eggs and secretes estrogen

ovipary type of reproduction in which an embryo develops within an egg outside the mother's body

ovovivipary type of reproduction in which an embryo develops inside an egg within the mother's body but in which the mother provides no nourishment to the developing embryo in the egg

ovulation release of a secondary oocyte from the uterus about half way through the menstrual cycle

ozone hole hole in the ozone layer high in the atmosphere over Antarctica caused by air pollution destroying ozone

1.16 P

paleontologist scientist who finds and studies fossils to learn about evolution and understand the past

Paleozoic Era age of "old life" from 544–245 million years ago that began with the Cambrian explosion and ended with the Permian extinction

pancreas gland near the stomach that secretes insulin and glucagon to regulate blood glucose and enzymes to help digest food

parasite species that benefits in a parasitic relationship

parasitism symbiotic relationship in which one species benefits while the other species is harmed

parathyroid glands a pair of small glands in the neck that secretes hormones that regulate blood calcium

passive immunity type of immunity to a particular pathogen that results when antibodies are transferred to a person who has never been exposed to the pathogen

passive transport movement of substances across a plasma membrane that does not require energy

pathogen disease-causing agent such as a bacterium, virus, fungus, or protozoan

pedigree chart showing how a trait is passed from generation to generation within a family

penis male reproductive organ containing the urethra, through which sperm and urine pass out of the body

periosteum tough, fibrous membrane that covers the outer surface of bone

peripheral nervous system (PNS) one of two major divisions of the nervous system that consists of all the nervous tissue that lies outside the central nervous system

peristalsis rapid, involuntary, wave-like contraction of muscles that pushes food through the GI tract and urine through the ureters

Permian extinction extinction at the end of the Paleozoic Period that was the biggest mass extinction the world had ever seen until then

petal outer parts of flowers that are usually brightly colored to attract animal pollinators

pH scale that is used to measure acidity

phagocytosis process in which leukocytes engulf and break down pathogens and debris

pharmacogenomics field that is tailoring medical treatments to fit our genetic profiles

pharynx long, tubular organ that connects the mouth and nasal cavity with the larynx through which air and food pass

phenotype characteristics of an organism that depend on how the organism's genotype is expressed

phloem type of vascular tissue in a plant that transports food from photosynthetic cells to other parts of the plant

phospholipid bilayer double layer of phospholipid molecules that makes up a plasma membrane

photic zone area in an aquatic biome that extends to a maximum depth of 200 meters

photoautotroph producer that uses energy from sunlight to make food by photosynthesis

photosynthesis process of using the energy in sunlight to make food (glucose)

photosystem group of molecules, including chlorophyll, in the thylakoid membrane of a chloroplast that captures light energy

phylogenetic tree diagram that shows how species are related to each other through common ancestors

phylogeny evolutionary history of a group of related organisms

phytoplankton bacteria and algae that use sunlight to make food

pineal gland gland of the endocrine system that secretes the hormone melatonin that regulates sleep-wake cycles

pioneer species type of species that first colonizes a disturbed area

pistil female reproductive structure of a flower that consists of a stigma, style, and ovary

pituitary gland master gland of the endocrine system that secretes many hormones, the majority of which regulate other endocrine glands

placenta temporary organ that consists of a large mass of maternal and fetal blood vessels through the mother's and fetus's blood exchange substances

placental mammal therian mammal in which a placenta develops during pregnancy to sustain the fetus while it develops inside the mother's uterus

plant multicellular eukaryote with chloroplasts, cell walls made of cellulose, and specialized reproductive organs

plasma golden-yellow fluid part of blood that contains many dissolved substances and blood cells

plasma membrane thin coat of lipids (phospholipids) that surrounds and encloses a cell

plasmid small, circular piece of DNA in a prokaryotic cell

platelet cell fragment in blood that helps blood clot

Platyhelminthes invertebrate phylum of flatworms that are characterized by a flat body because they lack a coelom or pseudocoelom

pleiotropy situation in which a single gene affects more than one trait

pneumonia disease in which the alveoli of the lungs become inflamed and filled with fluid as a result of infection or injury

point mutation change in a single nucleotide base in the genetic material

polarity difference in electrical charge between different parts of the same molecule

pollen tiny grains that bear the male gametes of seed plants and transfer sperm to female reproductive structures

pollination fertilization in plants in which pollen is transferred to female gametes in an ovary

polygenic characteristic characteristic, or trait, controlled by more than one gene, each of which may have two or more alleles

polymerase chain reaction (PCR) biotechnology process that makes many copies of a gene or other DNA segment

polynucleotide chain of nucleotides that alone or with another such chain makes up a nucleic acid

polyp basic body plan in cnidarians such as jellyfish that is tubular in shape and typically sessile

polypeptide chain of amino acids that alone or with other such chains makes up a protein

polysaccharide chain of monosaccharides that makes up a complex carbohydrate such as starch

population all the organisms of the same species that live in the same area

population density average number of individuals in a population per unit of area or volume

population distribution describes how the individuals are distributed, or spread throughout their habitat

population genetics science focusing on evolution within populations that is the area of overlap between evolutionary theory and Mendelian genetics

population growth rate (r) how fast a population changes in size over time

population pyramid bar graph that represents the age-structure of a population

Porifera invertebrate phylum of sponges, which have a non-bony endoskeleton and are sessile as adults

precipitation water that falls from clouds in the atmosphere to Earth's in the form of rain, snow, sleet, hail, or freezing rain

predation relationship in which members of one species consume members of another species

predator species that consumes another in a predator-prey relationship

prediction statement that tells what will happen under certain conditions

pregnancy carrying of one or more offspring from fertilization until birth

prey species that is consumed by another in a predator-prey relationship

primary succession change in the numbers and types of species that live in a community that occurs in an area that has never before been colonized

probability the likelihood, or chance, than a certain event will occur

producer organism that produces food for itself and other organisms

product substance that forms as the result of a chemical reaction

prokaryote single-celled organism that lacks a nucleus

prokaryotic cell cell without a nucleus that is found in single-celled organisms

promoter region of a gene where a RNA polymerase binds to initiate transcription of the gene

prophase first phase of mitosis during which chromatin condense into chromosomes, the nuclear envelope breaks down, centrioles separate, and a spindle begins to form

protein organic compound made up of amino acids

protein synthesis process in which cells make proteins that includes transcription of DNA and translation of mRNA

protist kingdom in the domain Eukarya that includes all eukaryotes except plants, animals, and fungi

protozoa (singular, protozoan) animal-like protists such as *Amoeba* and *Paramecium*

pseudocoelom partial, fluid-filled cavity inside the body of some invertebrates

pseudopod temporary, foot-like extension of the cytoplasm that some cells use for movement or feeding

psychoactive drug drug that affects the central nervous system, generally by influencing the transmission of never impulses in the brain

puberty period during which humans become sexually mature

pulmonary circulation part of the circulatory system that carries blood between the heart and lungs

punctuated equilibrium model of the timing of evolution in which long periods of little evolutionary change are interrupted by bursts of rapid evolutionary change

Punnett square chart for determining the expected percentages of different genotypes in the offspring of two parents

pupa life cycle stage of many insects that occurs between the larval and adult stages and during which the insect is immobile, may be encased within a cocoon, and changes into the adult form

1.17 Q

1.18 R

radial symmetry symmetry of a body plan in which there is a distinct top and bottom but not distinct head and tail ends, so the body can be divided into two halves like a pie

reactant starting material in a chemical reaction

recessive allele allele that is masked by the presence of another allele for the same gene when they occur together in a heterozygote

recombinant DNA DNA that results when DNA from two organisms is combined

red blood cell type of cell in blood that contains hemoglobin and carries oxygen

reflex rapid motor response to a sensory stimulus in which nerve impulses travel in an arc that includes the spinal cord but not the brain

regeneration regrowing of tissues, organs, or limbs that have been lost or damaged

regulatory element region of DNA where a regulatory protein binds

regulatory protein protein that regulates gene expression

relative dating method of dating fossils by their location in rock layers; determines which fossils are older or younger but not their age in years

renewable resource natural resource that can be replenished by natural processes as quickly as humans use it

reproduction process by which living things give rise to offspring

reproductive system system of organs that produces gametes and secretes sex hormones

reptile ectothermic, tetrapod vertebrate that lays amniotic eggs; includes crocodiles, lizards, snakes, and turtles

reservoir part of a biogeochemical cycle that holds an element or water for a long period of time

respiration exchange of gases between the body and the outside air

respiratory system organ system that brings oxygen into the body and releases carbon dioxide into the atmosphere

resting potential difference in electrical charge across the plasma membrane of a neuron that is not actively transmitting a nerve impulse

rhizoid hair-like structure in a nonvascular plant that absorbs water and minerals and anchors the plant to a surface

ribosomal RNA type of RNA that helps form ribosomes and assemble proteins

ribosome organelle inside all cells where proteins are made

ringworm skin infection caused by the fungus *Trichophyton* that causes a characteristic ring-shaped rash

RNA (ribonucleic acid) single-stranded nucleic acid that helps make proteins

RNA world hypothesis hypothesis that RNA was the first organic molecule to evolve and that early life was based on RNA, rather than DNA or protein

root hair tiny hairlike structure that extends from an epidermal cell of a plant root and increases the surface area for absorption

root system all the roots of a plant, including primary roots and secondary roots

***r*-selected** species in which population growth is rapid but death rates are high so population size is generally below the carrying capacity

runoff precipitation that falls on land and flows over the surface of the ground

1.19 S

saprotroph decomposer such as a fungus or protozoan that feeds on any remaining organic matter that is left after other decomposers do their work

saturated fatty acid molecule in lipids in which carbon atoms are bonded to as many hydrogen atoms as possible

sauropsid type of early amniote that evolved during the Carboniferous Period and eventually gave rise to dinosaurs, reptiles, and birds

scavenger decomposer that consumers the soft tissues of dead animals

science distinctive way of gaining knowledge about the natural world that tries to answer questions with evidence and logic

scientific investigation plan for asking questions and testing possible answers

scientific law statement describing what always happens under certain conditions in nature

scientific method the process of a scientific investigation

scientific theory broad explanation that is widely accepted as true because it is supported by a great deal of evidence

sebaceous gland gland in the dermis of skin that produces sebum, an oily substance that waterproofs the skin and hair

secondary succession change in the numbers and types of species that live in a community that occurs in an area that was previously colonized but has been disturbed

seed structure produced by a seed plant that contains an embryo and food supply enclosed within a tough coat

seed coat tough covering of a seed that protects the embryo and keeps it from drying out until conditions are favorable for germination

segmentation division of an animal body into multiple segments

semen fluid containing sperm and gland secretions that nourish sperm and carry them through the urethra and out of the body

sensory neuron type of neuron that carries nerve impulses from tissue and organs to the spinal cord and brain

sensory receptor specialized nerve cell that responds to a particular type of stimulus such as light or chemicals

sepal part of a flower that helps protect it while it is still in bud

sessile of or relating to an animal that is unable to move from place to place

sex chromosome X or Y chromosome (in humans)

sex hormone chemical messenger that controls sexual development and reproduction

sex-linked gene gene located on a sex chromosome

sex-linked trait traits controlled by a gene located on a sex chromosome

sexual dimorphism differences between the phenotypes of males and females of the same species

sexually transmitted infection (STI) infection caused by a pathogen that spreads mainly through sexual contact; also known as sexually transmitted disease (STD)

sexual reproduction type of reproduction that involves the fertilization of gametes produced by two parents and produces genetically variable offspring

sixth mass extinction current mass extinction caused primarily by habitat loss due to human actions

skeletal muscle voluntary, striated muscle that is attached to bones of the skeleton and helps the body move

skeletal system human body system that consists of all the bones of the body as well as cartilage and ligaments

sliding filament theory theory that explains muscle contraction by the sliding of myosin filaments over actin filaments within muscle fibers

slime mold fungus-like protist commonly found on rotting logs and other decaying organic matter

small intestine long, narrow, tube-like organ of the digestive system where most chemical digestion of food and virtually all absorption of nutrients take place

smooth muscle involuntary, nonstriated muscle that is found in the walls of internal organs such as the stomach

social animal animal that lives in a society

society close-knit group of animals of the same species that live and work together

sodium-potassium pump type of active transport in which sodium ions are pumped out of the cell and potassium ions are pumped into the cell with the help of a carrier protein and energy from ATP

soil mixture of eroded rock, minerals, organic matter, and other materials that is essential for plant growth and forms the foundation of terrestrial ecosystems

solution mixture that has the same composition throughout

somatic mutation mutation that occurs in cells of the body other than gametes

somatic nervous system (SNS) division of the peripheral nervous system that controls voluntary, conscious activities and reflexes

spawning depositing large numbers of gametes in the same place and at the same time by fish or amphibians

specialization evolution of different adaptations in competing species, which allows them to live in the same area without competing

speciation process by which a new species evolves

species group of organisms that are similar enough to mate together and produce fertile offspring

sperm male gamete

spermatogenesis process of producing sperm in the testes

spermatophyte type of plant that reproduces by producing seeds

spinal cord thin, tubular bundle of nervous tissue that extends from the brainstem down the back to the pelvis and connects the brain with the peripheral nervous system

spongy bone light, porous inner layer of bone that contains bone marrow

sporangium (plural, sporangia) structure on a plant of the sporophyte generation that produces spores for asexual reproduction

sporophyte diploid generation in the life cycle of a plant that results from sexual reproduction with gametes and that produces spores for asexual reproduction

sporozoa (singular, sporozoan) type of protozoa that cannot move as adults

stabilizing selection type of natural selection for a polygenic trait in which phenotypes at both extremes of the phenotypic distribution are selected against, resulting in a narrowing of the range of phenotypic variation

stamen male reproductive structure of a flower that consists of a stalk-like filament and a pollen-producing anther

stimulus something that triggers a behavior

stomach sac-like organ of the digestive system between the esophagus and small intestine in which both mechanical and chemical digestion take place

stomata (singular, stoma) tiny pore in the epidermis of a plant leaf that controls transpiration and gas exchange with the air

stroma space outside the thylakoid membranes of a chloroplast where the Calvin cycle of photosynthesis takes place

sublimation process in which ice and snow change directly to water vapor

survivorship curve graph that represents the individuals still alive at each age in a population

sustainable use use of resources in a way that meets the needs of the present and also preserves the resources for the use of future generations

sweat gland gland in the dermis of skin that produces the salty fluid called sweat, which excretes wastes and helps cool the body

swim bladder balloon-like internal organ in most fish that can be used to move up or down through the water column by changing the amount of gas it contains

symbiosis close relationship between organisms of different species in which at least one of the organisms benefits from the relationship

sympatric speciation evolution of a new species that occurs when without geographic separation first occurring between members of an original species

synapse place where an axon terminal meets another cell

synapsid type of early amniote that evolved during the Carboniferous Period and eventually gave rise to mammals

synthetic biology field of biology involved in engineering new functions from living systems

syphilis sexually transmitted infection caused by bacteria that may eventually be fatal if untreated

systemic circulation part of the circulatory system that carries blood between the heart and body

1.20 T

taproot single, thick primary root that characterizes the root system of some plants

target cell type of cell on which a particular hormone has an effect because it has receptor molecules for the hormone

TATA box regulatory element that is part of the promoter of most eukaryotic genes

taxa a grouping of organisms in a classification system such as the Linnaean system; for example, species or genus

taxonomy science of classifying organisms

T cell type of lymphocyte involved in cell-mediated immunity in which cells infected with viruses are destroyed

telophase last stage of mitosis during which chromosomes uncoil to form chromatin, the spindle breaks down, and new nuclear membranes form

tendon tough connective tissue that attaches skeletal muscle to bones of the skeleton

terrestrial biome a biome of or pertaining to land, as in terrestrial ecosystem

testis (plural, testes) one of two male reproductive organs that produces sperm and secretes testosterone

testosterone male sex hormone secreted by the testes

tetrapod vertebrate with four legs (amphibian, reptile, bird, or mammal)

therapsid type of extinct organism that lived during the Permian Period and gave rise to mammals

therian mammal viviparous mammal that may be either a marsupial or placental mammal

thylakoid membrane membrane in a chloroplast where the light reactions of photosynthesis occur

thyroid gland large endocrine gland in the neck that secretes hormones that control the rate of cellular metabolism throughout the body

tissue group of cells of the same kind that perform a particular function in an organism

trachea long, tubular organ of the respiratory system, also called the wind pipe, that carries air between the larynx and lungs

tracheophyte type of plant that has vascular tissues, such as a seed plant or flowering plant

transcription process in which genetic instructions in DNA are copied to form a complementary strand of mRNA

transfer RNA (tRNA) type of RNA that brings amino acids to ribosomes where they are joined together to form proteins

transgenic crop crop that has been genetically modified with new genes that code for traits useful to humans

translation process in which genetic instructions in mRNA are "read" to synthesize a protein

transpiration process in which plants give off water vapor from photosynthesis through tiny pores, called stomata, in their leaves

transport protein protein in a plasma membrane that helps other substances cross the membrane

trichomoniasis common sexually transmitted infection that is caused by protozoa

trilobite oldest known arthropod, which is now extinct and known only from numerous fossils

trophic level feeding position in a food chain or food web, such as producer, primary consumer, or secondary consumer

tropism turning by an organism or part of an organism toward or away from an environmental stimulus

tumor abnormal mass of cells that may be cancerous

tunicates members of the subphylum Urochordata are tunicates (also called sea squirts)

1.21 U

unsaturated fatty acid molecule in lipids in which some carbon atoms are bonded to other groups of atoms rather than to hydrogen atoms

ureter muscular, tube-like organ of the urinary system that moves urine by peristalsis from a kidney to the bladder

urethra muscular, tube-like organ of the urinary system that carries urine out of the body from the bladder; in males, it also carries sperm out of the body

urinary system organ system that includes the kidneys and is responsible for filtering waste products and excess water from the blood and excreting them from the body

urination process in which urine leaves the body through a sphincter at the end of the urethra

urine liquid waste product of the body that is formed by the kidneys and excreted by the other organs of the urinary system

uterus (plural, uteri) female reproductive organ in therian mammals where an embryo or fetus grows and develops until birth

1.22 V

vaccine substance containing modified pathogens that does not cause disease but provokes an immune response and results in immunity to the pathogen

vacuole large saclike organelle that stores and transports materials inside a cell

vagina female reproductive organ that receives sperm during sexual intercourse and provides a passageway for a baby to leave the mother's body during birth

vascular tissue type of tissue in plants that transports fluids through the plant; includes xylem and phloem

vector organism such as an insect that spreads pathogens from host to host

vegetative reproduction asexual reproduction in plants using nonreproductive tissues such as leaves, stems, or roots

vein type of blood vessel that carries blood toward the heart from the lungs or body

ventilation process of carrying air from the atmosphere into the lungs

vertebrae (singular, vertebra) repeating bony units that make up the vertebral column of vertebrates

vertebral column bony support structure that runs down the back of a vertebrate animal; also called a backbone

vertebrate animal with a vertebral column, or backbone

vesicle small saclike organelle that stores and transports materials inside a cell

vesicle transport type of active transport in which substances are carried across the cell membrane by vesicles

vestigial structure structure such as the human tailbone or appendix that evolution has reduced in size because it is no longer used

villi (singular, villus) microscopic, finger-like projections in the mucous membrane lining the small intestine that form a large surface area for the absorption of nutrients

virion individual virus particle that consists of nucleic acid within a protein capsid

virus tiny, nonliving particle that contains DNA but lacks other characteristics of living cells

vitamin organic compound needed in small amounts for proper body functioning

vivipary type of reproduction in which an embryo develops within, and is nourished by, the mother's body

vulva external female reproductive structures, including the labia and vaginal opening

1.23 W

water cycle interconnected pathways through which water is recycled through the biotic and abiotic components of the biosphere

water mold fungus-like protist commonly found in moist soil and surface water

weed plant that is growing where people do not want it

wetland area that is saturated with water or covered by water for at least one season of the year

white blood cell type of cell in blood that defends the body against invading microorganisms or other threats in blood or extracellular fluid

1.24 X

xerophyte plant that is adapted to a very dry environment

X-linked gene gene located on the X chromosome

X-linked trait trait controlled by a gene located on the X chromosome

xylem type of vascular tissue in a plant that transports water and dissolved nutrients from roots to stems and leaves

1.25 Y

1.26 Z

zooplankton tiny animals that feed on phytoplankton

zygospore diploid spore in fungi that is produced by the fusion of two haploid parent cells

zygote diploid cell that forms when two haploid gametes unite during fertilization