



# Biology Scope and Sequence

Grading Period	Unit Title	Learning Targets
<b>Throughout the School Year</b>		<p>B.(1) Scientific processes. The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:</p> <ul style="list-style-type: none"><li>(A) demonstrate safe practices during laboratory and field investigations, including chemical, electrical, and fire safety, and safe handling of live and preserved organisms; and</li><li>(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.</li></ul> <p>B.(2) Scientific processes. The student uses scientific methods during laboratory and field investigations. The student is expected to:</p> <ul style="list-style-type: none"><li>(A) know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section;</li><li>(B) know that scientific hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories;</li><li>(C) know that scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but they may be subject to change as new areas of science and new technologies are developed;</li><li>(D) distinguish between scientific hypotheses and scientific theories;</li><li>(E) plan and implement investigative procedures, including asking questions, formulating testable hypotheses, and selecting, handling, and maintaining appropriate equipment and technology;</li><li>(F) collect data individually or collaboratively, make measurements with precision and accuracy, record values using appropriate units, and calculate statistically relevant quantities to describe data, including mean, median, and range;</li><li>(G) demonstrate the use of course apparatuses, equipment, techniques, and procedures;</li><li>(H) organize, analyze, evaluate, build models, make inferences, and predict trends from data;</li><li>(I) perform calculations using dimensional analysis, significant digits, and scientific notation; and</li><li>(J) communicate valid conclusions using essential vocabulary and multiple modes of expression such as lab reports,</li></ul>

	<p>labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.</p> <p>B.(3) Scientific processes. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:</p> <p>(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;</p> <p>(B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;</p> <p>(C) draw inferences based on data related to promotional materials for products and services;</p> <p>(D) evaluate the impact of research and technology on scientific thought, society, and the environment;</p> <p>(E) describe the connection between aquatic science and future careers; and</p> <p>(F) research and describe the history of aquatic science and contributions of scientists.</p>	
<p><b>First Grading Period</b></p>	<p>Cell Theory and Organelles</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> List characteristics of living things (1. One or more cells, 2. Need a source of energy to carry out life processes, 3. Can respond to the environment, 4. Can reproduce and develop, 5. System of related parts, 6. Maintain homeostasis and 7. Evolve and adapt)</li> <li><input type="checkbox"/> describe how structure is related to function</li> <li><input type="checkbox"/> Describe the scientist's contribution to the Cell Theory (Hooke, Leeuwenhoek, Schleiden, Schwann, Virchow)</li> <li><input type="checkbox"/> Describe the three principles of Cell Theory (all organisms are made of one or more cells, basic unit of structure, all cells come from cells)</li> <li><input type="checkbox"/> Compare structures found in the two cells types: prokaryotic cells (bacteria) and eukaryotic cells (animals, plants, fungi, protist)</li> <li><input type="checkbox"/> Locate and focus on an object under a light microscope using the coarse adjustment and fine adjustment</li> <li><input type="checkbox"/> Describe how to report the magnification on a light microscope</li> <li><input type="checkbox"/> Describe data as qualitative or quantitative</li> <li><input type="checkbox"/> Assign proper SI Units to lab equipment: cm, <math>\mu\text{m}</math>, mL, <math>^{\circ}\text{C}</math>, g, mg</li> <li><input type="checkbox"/> Identify major structures present in a model of a eukaryotic cell (cell wall, chloroplast, endoplasmic reticulum, Golgi apparatus, mitochondria, nucleus, plasma membrane, ribosome)</li> <li><input type="checkbox"/> Describe the cellular function of the organelles listed above</li> <li><input type="checkbox"/> Describe the major structural differences in animal cells and plant cells</li> </ul>

	<p>Cell Membrane and Cellular Transport</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> describe the structure of a phospholipid (hydrophilic head and hydrophobic tail) and relate it to its function in the cell membrane</li> <li><input type="checkbox"/> identify the membrane proteins found in the plasma membrane and describe their functions: 1. transport protein (protein channel, carrier protein), 2. receptor protein, and 3. marker protein (glycoprotein)</li> <li><input type="checkbox"/> explain how selective permeability of the cell membrane maintains homeostasis</li> <li><input type="checkbox"/> explain how a concentration gradient results in diffusion across a cell membrane</li> <li><input type="checkbox"/> distinguish between the types of passive transport: simple diffusion and facilitated diffusion</li> <li><input type="checkbox"/> predict the movement of water (osmosis) into/out of a cell when place in the three types of osmotic solutions: isotonic, hypotonic, hypertonic</li> <li><input type="checkbox"/> explain why energy (ATP) is needed to actively transport substances across a cell membrane</li> <li><input type="checkbox"/> compare and contrast passive transport and active transport and give examples of each</li> <li><input type="checkbox"/> differentiate between endocytosis and exocytosis</li> </ul>
	<p>Biomolecules</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> distinguish between an atom, an ion, and a molecule</li> <li><input type="checkbox"/> describe the significance of covalent bonds to biological systems</li> <li><input type="checkbox"/> explain how the properties of water (cohesion, adhesion, surface tension, universal solvent, capillary action, high specific heat) are important to biological systems</li> <li><input type="checkbox"/> describe the significance of hydrogen bonding to biological systems</li> <li><input type="checkbox"/> compare and contrast covalent bonds and hydrogen bonds</li> <li><input type="checkbox"/> describe a biomolecule</li> <li><input type="checkbox"/> describe how biomolecules are polymers made up of monomers held together by covalent bonds</li> <li><input type="checkbox"/> identify a structure as a carbohydrate (monosaccharide, polysaccharide)</li> <li><input type="checkbox"/> describe the functions of carbohydrates (immediate energy, energy storage, structure)</li> <li><input type="checkbox"/> describe the specific uses of polysaccharides in organisms (starch, cellulose, chitin, cellulose)</li> <li><input type="checkbox"/> identify a structure as a lipid (3 fatty acid + glycerol = triglyceride, phosphate group + 2 fatty acids = phospholipid)</li> <li><input type="checkbox"/> identify a hydrocarbon chain as saturated or unsaturated</li> <li><input type="checkbox"/> describe the functions of lipids (long-term energy storage, structure, insulation)</li> <li><input type="checkbox"/> identify the structural components of a protein (amino acids, peptide bond, polypeptide)</li> <li><input type="checkbox"/> list and describe the various uses of protein in living things (enzymes, structural components)</li> <li><input type="checkbox"/> identify the three components of a nucleotide (phosphate group, pentose sugar and nitrogenous base)</li> <li><input type="checkbox"/> describe the functions nucleic acid (genetic information storage, protein synthesis)</li> </ul>

	ATP, Reactions and Enzymes	<ul style="list-style-type: none"> <li><input type="checkbox"/> describe the structure of adenosine triphosphate (ATP) – 3 phosphate groups, adenine, and ribose</li> <li><input type="checkbox"/> describes the function of ATP in a cell</li> <li><input type="checkbox"/> explain the cycle of ATP (use and recovery)</li> <li><input type="checkbox"/> identify the parts of the photosynthesis chemical reaction (reactants, products)  <math display="block">(6 \text{ H}_2\text{O} + 6 \text{ CO}_2 \rightarrow \rightarrow \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{ O}_2)</math> </li> <li><input type="checkbox"/> describe how biomolecules can be joined together (dehydration synthesis reaction) or broken apart (hydrolysis reaction)</li> <li><input type="checkbox"/> identify the significant components of an enzyme reaction (enzyme, active site, substrate, reactants, products)</li> <li><input type="checkbox"/> explain the effect an enzyme has on activation energy</li> <li><input type="checkbox"/> investigate the conditions that affect enzyme function (temperature, pH)</li> <li><input type="checkbox"/> interpret an enzyme activity graph</li> </ul>
	Photosynthesis, Respiration and Fermentation	<ul style="list-style-type: none"> <li><input type="checkbox"/> describe the chemical equation for photosynthesis, using written words and chemical formulas  <math display="block">(6 \text{ H}_2\text{O} + 6 \text{ CO}_2 \rightarrow \rightarrow \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{ O}_2)</math> </li> <li><input type="checkbox"/> identify the locations of each reaction of photosynthesis in chloroplasts (thylakoid membrane, stroma)</li> <li><input type="checkbox"/> describe the reactants and products for each reaction of photosynthesis (light dependent reaction and light independent reaction)</li> <li><input type="checkbox"/> identify the role of NADP<sup>+</sup> and NADPH (electron carriers) in photosynthesis</li> <li><input type="checkbox"/> interpret a light spectrum graph of chlorophyll</li> <li><input type="checkbox"/> describe the chemical equation for cellular respiration, using written words and chemical formulas  <math display="block">(\text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{ O}_2 \rightarrow 6 \text{ H}_2\text{O} + 6 \text{ CO}_2)</math> </li> <li><input type="checkbox"/> identify the locations of the reactions of cellular respiration in mitochondria (cytoplasm, matrix, inner membrane, intermembrane space)</li> <li><input type="checkbox"/> identify the amount of ATP produced at each stage of cellular respiration (glycolysis, Krebs cycle, electron transport chain [ETC])</li> <li><input type="checkbox"/> identify the role of NAD<sup>+</sup>/NADH and FAD/FADH<sub>2</sub> (electron carriers) in cellular respiration</li> <li><input type="checkbox"/> compare the reactions of photosynthesis to those of cellular respiration</li> <li><input type="checkbox"/> explain the purpose of fermentation</li> <li><input type="checkbox"/> identify the products of the two types of fermentation (lactic acid and alcoholic)</li> <li><input type="checkbox"/> describe the benefits of fermentation</li> </ul>

<b>Second Grading Period</b>	DNA, Cell Cycle and Mitosis	<ul style="list-style-type: none"> <li><input type="checkbox"/> identify the scientists and their contribution toward DNA structure and function (Hershey &amp; Chase, Chargaff, Watson &amp; Crick, Franklin)</li> <li><input type="checkbox"/> identify the components of a nucleotide (phosphate, pentose sugar, nitrogenous base)</li> <li><input type="checkbox"/> apply Chargaff's rule to DNA structure (base pairing: A=T, C=G)</li> <li><input type="checkbox"/> identify the structure of a DNA molecule (double helix, sugar-phosphate backbone, hydrogen bond)</li> <li><input type="checkbox"/> explain the process of DNA replication</li> <li><input type="checkbox"/> list and describe the functions of the key enzymes used in replication (helicase, DNA polymerase)</li> <li><input type="checkbox"/> Explain the relationship between the factors that limit cell size (surface area to volume ratio and diffusion)</li> <li><input type="checkbox"/> Describe the relationship between chromosome, chromatid, chromatin, histones and DNA</li> <li><input type="checkbox"/> List and identify individual phases of the cell cycle (Interphase [G<sub>1</sub>, S, G<sub>2</sub>], Mitosis, Cytokinesis)</li> <li><input type="checkbox"/> Explain the purpose of mitosis in organisms (growth/development, reproduction, repair)</li> <li><input type="checkbox"/> Explain the events that occur in each phase of mitosis (prophase, metaphase, anaphase, telophase)</li> <li><input type="checkbox"/> Explain the relationship between cell cycle and cancer (disruption of the cell cycle and damage to the DNA)</li> <li><input type="checkbox"/> Identify external factors (cell to cell contact, growth factors) and internal factors (check points) that regulate cellular division</li> <li><input type="checkbox"/> Identify different causes of cancer (environmental, DNA mutations, control of cell cycle)</li> <li><input type="checkbox"/> Compare and contrast binary fission and mitosis</li> <li><input type="checkbox"/> Compare the advantages and disadvantages of asexual reproduction to sexual reproduction</li> <li><input type="checkbox"/> Explain how stem cells develop into different cell types through cell differentiation</li> </ul>
	Protein Synthesis	<ul style="list-style-type: none"> <li><input type="checkbox"/> *compare and contrast DNA to RNA (double strand vs. single strand, thymine vs. uracil, deoxyribose vs. ribose)</li> <li><input type="checkbox"/> describe the process of transcription and translation (DNA → mRNA → protein)</li> <li><input type="checkbox"/> use the codon charts/wheel to find the corresponding amino acids as coded for in a section of mRNA</li> <li><input type="checkbox"/> list and describe the functions of the different types of RNA used in protein synthesis (mRNA, tRNA)</li> <li><input type="checkbox"/> describe the function of RNA polymerase</li> <li><input type="checkbox"/> recognize how gene expression is regulated in prokaryotic cells through the use of an operon</li> <li><input type="checkbox"/> explain how mRNA is processed prior to translation (removal of introns)</li> <li><input type="checkbox"/> describe the different types of gene mutations (point mutation, frame shift)</li> </ul>

		<input type="checkbox"/> describe the different types of chromosomal mutations that can occur (duplication, translocation, inversion)
	Mendel and Meiosis	<input type="checkbox"/> Compare and contrast haploid (n) and diploid (2n) cells <input type="checkbox"/> Compare body cells to gamete <input type="checkbox"/> Explain the purpose of meiosis in regards to gamete formation <input type="checkbox"/> Explain and identify the phases of meiosis (Meiosis I and Meiosis II) <input type="checkbox"/> Identify different types of chromosomes (autosomes, homologous chromosomes, sex chromosomes) <input type="checkbox"/> Compare the results of meiosis in both females and males <input type="checkbox"/> Compare the process of meiosis to mitosis <input type="checkbox"/> Identify the importance of Mendel and his two laws (Law of Segregation and Law of Independent Assortment) <input type="checkbox"/> Compare genotype (TT, Tt, tt) and phenotype (physical trait) <input type="checkbox"/> Determine the expected phenotypic ratio and percentage of an offspring's traits in both monohybrid and dihybrid genetic crosses. <input type="checkbox"/> Accurately predict the outcome of various crosses by using a Punnett square and information from P, F <sub>1</sub> , & F <sub>2</sub> generations <input type="checkbox"/> Explain when and how genetic recombination occurs (crossing over/Prophase I & independent assortment/Anaphase I) <input type="checkbox"/> Identify errors that can occur in meiosis and the impact on the organism (nondisjunction → monosomy, trisomy) <input type="checkbox"/> Complete a Punnett square for non-Mendelian inheritance (codominance, incomplete dominance, multiple alleles, sex-linked genes) <input type="checkbox"/> Recognize that some traits are the results many different genes working together (polygenic inheritance) <input type="checkbox"/> Distinguish between external and internal influences on traits (gender, age, climate, season, hormones)

<b>Third Grading Period</b>	Evolution	<ul style="list-style-type: none"> <li><input type="checkbox"/> provide scientific estimates for the age of earth and when life originated</li> <li><input type="checkbox"/> determine the relative order of past events (<b>relative dating</b>) by comparing the location of fossils in <b>strata</b></li> <li><input type="checkbox"/> identify scientists and their experiments that supported the concept of the development of early life (Miller &amp; Urey)</li> <li><input type="checkbox"/> explain the <b>endosymbiont theory</b> (Margulis) and how it relates to the formation of eukaryotic cells</li> <li><input type="checkbox"/> summarize Charles Darwin's theory of <b>natural selection</b></li> <li><input type="checkbox"/> describe the four principles of natural selection (variation, overproduction, adaptation, descent with modification)</li> <li><input type="checkbox"/> describe the types of <b>anatomical</b> homologies (<b>homologous structures</b>)</li> <li><input type="checkbox"/> describe <b>developmental</b> homologies (<b>embryology</b>)</li> <li><input type="checkbox"/> describe <b>molecular</b> homologies (DNA sequence analysis)</li> <li><input type="checkbox"/> describe the different modes of natural selection on populations (<b>directional, stabilizing, and disruptive selection</b>)</li> <li><input type="checkbox"/> describe how changes in <b>allelic frequencies</b> occur by chance (<b>genetic drift, gene flow, mutation, recombination</b>)</li> <li><input type="checkbox"/> describe the types of events that can lead to <b>speciation</b> (<b>geographic, behavioral, temporal</b>) compare the rates of evolution <b>gradualism</b> vs. <b>punctuated equilibrium</b> (<b>stasis &amp; sudden appearance</b>)</li> </ul>
	Taxonomy, Protist & Fungi	<ul style="list-style-type: none"> <li><input type="checkbox"/> explain the purpose of <b>taxonomy</b></li> <li><input type="checkbox"/> explain the history and methods of taxonomy</li> <li><input type="checkbox"/> explain the significance of modern classification (<b>binomial nomenclature</b>)</li> <li><input type="checkbox"/> classify organisms using dichotomous key</li> <li><input type="checkbox"/> describe the organization of taxa in a biological classification system. (DKPCOFGs)</li> <li><input type="checkbox"/> interpret a phylogenetic tree/cladogram to determine the evolutionary relationships <b>between organisms</b></li> <li><input type="checkbox"/> describe the evolutionary relationships of the 3 domains and list the kingdoms associated with each</li> <li><input type="checkbox"/> compare the characteristics of the six kingdoms of life (cell type, cell wall composition, feeding methods, levels of organization, and examples) <b>page R27-R30</b></li> <li><input type="checkbox"/> identify and describe different types of protists (animal like, plant like, fungus like)</li> <li><input type="checkbox"/> identify the structural characteristics of fungi (chitin, hyphae, mycelium, spores) and their role as a decomposer in ecology</li> <li><input type="checkbox"/> examine the importance of protists and fungi in regards to medicine (penicillin) and disease in humans (athlete's foot and malaria (plasmodium))</li> </ul>

	<p>Bacteria, Viruses and Biotechnology</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> describe the characteristics of archaea</li> <li><input type="checkbox"/> compare and contrast the different types of bacteria (bacillus, cocci, spirilli, streptococci, staphylococci, diplococci)</li> <li><input type="checkbox"/> Identify the structures of a bacterium (pili, nucleoid, flagella, plasmid, capsule)</li> <li><input type="checkbox"/> describe the two ways in which bacteria reproduce (binary fission &amp; conjugation)</li> <li><input type="checkbox"/> describe the beneficial roles of prokaryotes</li> <li><input type="checkbox"/> describe the function of antibiotics and how improper use can lead to antibiotic resistance</li> <li><input type="checkbox"/> Identify the structure of a virus (capsid, viral envelope, genetic material, glycoprotein)</li> <li><input type="checkbox"/> compare and contrast the reproductive cycles of viruses (lytic /lysogenic)</li> <li><input type="checkbox"/> explain the relationship between the reproductive cycle of viruses (such as HIV, and Influenza) and disease in a host</li> <li><input type="checkbox"/> explain how restriction enzymes cut DNA (sticky ends &amp; blunt ends)</li> <li><input type="checkbox"/> explain the process and purpose of gel electrophoresis</li> <li><input type="checkbox"/> explain the purpose polymerase chain reaction (PCR)</li> <li><input type="checkbox"/> explain how DNA fingerprinting is used for identification and analysis of genomes</li> <li><input type="checkbox"/> describe how organisms are cloned</li> <li><input type="checkbox"/> describe the process of genetic engineering using recombinant DNA</li> <li><input type="checkbox"/> describe both sides of the argument concerning genetically modified organisms (GMOs)</li> </ul>
	<p>Plants</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> describe the structures of plant cells that make them unique from other eukaryotic cells (cell wall, cellulose, chloroplast, large central vacuole)</li> <li><input type="checkbox"/> distinguish the functions and locations of the three types of plant tissues (ground, dermal, vascular)</li> <li><input type="checkbox"/> compare and contrast xylem and phloem</li> <li><input type="checkbox"/> identify evolutionary origins of land plants by looking at currently existing plant groups (nonvascular, and vascular plants)</li> <li><input type="checkbox"/> identify the structures and functions of roots, stems, and leaves</li> <li><input type="checkbox"/> identify the structures found in a cross section of roots, stems, and leaves</li> <li><input type="checkbox"/> distinguish between primary and secondary growth of plants</li> <li><input type="checkbox"/> compare monocotyledons and dicotyledons (structure: roots, stems, leaves, petals, seed)</li> <li><input type="checkbox"/> describe the alternation of generation in plants (gametophyte &amp; sporophyte phases)</li> <li><input type="checkbox"/> identify the structure and function of a flower: <b>carpel</b> (stigma, style, ovary, ovule), <b>stamen</b> (anther, filament)</li> </ul>

		<ul style="list-style-type: none"> <li><input type="checkbox"/> identify the process of fertilization in a flowering plant</li> <li><input type="checkbox"/> describe the structure and function of a seed (seed coat, endosperm, embryo)</li> <li><input type="checkbox"/> describe different methods for plants to asexually reproduce (stolons, tubers, bulbs)</li> <li><input type="checkbox"/> list the plant hormones and describe their function (ethylene, cytokinins, auxins)</li> <li><input type="checkbox"/> name and describe various plant tropisms (gravi-, photo-, thigmo-)</li> </ul>
<b>Fourth Grading Period</b>	<b>Human Body Systems</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> List and describe the systems of the body and their functions (Respiratory, Circulatory, Digestive, Immune, Reproductive, Excretory, Nervous, Integumentary, Muscular, Skeletal, Lymphatic)</li> <li><input type="checkbox"/> Describe the levels of biological organization (cells, tissues, organs, organ system, organism)</li> <li><input type="checkbox"/> Examine and describe the three muscle types (smooth, skeletal, cardiac)</li> <li><input type="checkbox"/> Explain the role of <b>feedback</b> mechanisms in maintaining <b>homeostasis</b> (positive &amp; negative)</li>   <li><input type="checkbox"/> Describe the role of <b>capillaries</b> for absorption and exchange between cells and their surroundings.</li> <li><input type="checkbox"/> Describe the three types of blood vessels (<b>arteries, veins, capillary</b>)</li> <li><input type="checkbox"/> Describe the composition of blood (<b>plasma, platelets, red blood cells, white blood cells</b>)</li>   <li><input type="checkbox"/> Compare mechanical and chemical digestion</li> <li><input type="checkbox"/> Identify and describe the role of the digestive organs: <b>esophagus, stomach, liver, gallbladder, pancreas, small intestine, large intestine, rectum and anus</b></li> <li><input type="checkbox"/> Explain how <b>food/nutrients</b> go from its original form to one that can enter the blood stream through <b>microvilli</b></li> <li><input type="checkbox"/> Describe how the kidney functions in the <b>excretory system</b> for <b>filtration</b>, reabsorption, and <b>excretion</b> of waste to maintain homeostasis (kidney, ureter, urinary bladder, urethra)</li>   <li><input type="checkbox"/> Identify the component parts of the nervous system ( <b>brain, nerves, and neurons</b>)</li> <li><input type="checkbox"/> Draw and label the <b>structure</b> of a <b>neuron (cell body, axon, dendrites, myelin sheath, axon terminals)</b></li> <li><input type="checkbox"/> Describe the differences between <b>central</b> and <b>peripheral nervous systems</b></li> <li><input type="checkbox"/> Identify the role of <b>hypothalamus</b> and <b>pituitary</b></li>   <li><input type="checkbox"/> Identify the roles of <b>blood, lymph, and white blood cells</b> in the immune system</li> <li><input type="checkbox"/> Identify examples of <b>nonspecific immunity (skin, mucus, inflammation, fever)</b></li> <li><input type="checkbox"/> Identify examples of <b>specific immunity (B-Cells, antibodies, T-Cells, memory cells)</b></li> </ul>

		<ul style="list-style-type: none"> <li><input type="checkbox"/> Describe the role of the lymphatic system in the body.</li> <li><input type="checkbox"/> Compare and contrast <b>gametogenesis</b> in females and males</li> <li><input type="checkbox"/> Give examples of how <b>hormones</b> control the female and male reproductive systems (ovulation, corpus luteum, follicle)</li> <li><input type="checkbox"/> Describe the path taken by both eggs and sperm in human fertilization (ovary, fallopian tube, uterus, cervix, vagina, urethra, testicle)</li> </ul>
	Ecology	<ul style="list-style-type: none"> <li><input type="checkbox"/> list and differentiate levels of biological organization in ecology (organism, species, population, community, ecosystem, biome, biosphere).</li> <li><input type="checkbox"/> differentiate between trophic levels: autotrophs (photosynthetic, chemosynthetic) &amp; heterotrophs (herbivore, omnivore, carnivore)</li> <li><input type="checkbox"/> describe the components and trace the flow of energy and matter in an ecosystem from the ultimate source (sun) to primary, secondary, tertiary, and quaternary consumers using ecological pyramids, food chains, and food webs</li> <li><input type="checkbox"/> describe the flow of matter and consequences of disruptions of the carbon and nitrogen cycles</li> <li><input type="checkbox"/> identify the five types of symbiotic relationships (predation, competition, mutualism, commensalism, parasitism)</li> <li><input type="checkbox"/> summarize the role of microorganisms in the maintenance and disruption of ecosystems</li> <li><input type="checkbox"/> Predict the type of survivorship curve based on an organism's characteristics (Type I, Type II, and Type III)</li> <li><input type="checkbox"/> compare and contrast exponential (J-shaped) and logistics (S-shaped) in regards to population growth</li> <li><input type="checkbox"/> describe how density factors affect population growth (density-independent &amp; density-dependent limiting factors)</li> <li><input type="checkbox"/> describe the sequence of events under which primary and secondary succession take place</li> <li><input type="checkbox"/> explain how greenhouse gases lead to global warming's effect on ecosystems</li> <li><input type="checkbox"/> describe how toxins accumulate as you move through the trophic levels in the food chain (biomagnification)</li> <li><input type="checkbox"/> explain the importance of biodiversity to humans (ex: medicine, biotechnology) and nature (ex: ecosystem stability)</li> <li><input type="checkbox"/> describe threats to biodiversity (such as: habitat loss, habitat fragmentation, habitat degradation, invasive species) and the consequences they pose</li> </ul>
	Animals and Dissections	<ul style="list-style-type: none"> <li><input type="checkbox"/> identify and describe the role of the three embryonic germ layers in regard to animal development (<b>ectoderm, mesoderm, endoderm</b>)</li> <li><input type="checkbox"/> describe developmental patterns in animals from fertilization to a <b>blastula</b> (p. 676)</li> <li><input type="checkbox"/> identify the forms of symmetry found in animals (<b>asymmetry, radial, bilateral</b>)</li> <li><input type="checkbox"/> label the anatomical directional terms of various animals (<b>ventral, dorsal, anterior,</b></li> </ul>

**posterior, proximal, distal)** (p. 675, 734)

- distinguish between the three body plans (**acoelomate, pseudocoelomate, and coelomate**)
- Identify and label: **aortic arches, crop, gizzard, clitellum, setae, brain, pharynx, intestine, ventral nerve vessel, dorsal blood vessel, segment**
- Identify and label: **nares, glottis, pinnae, papillae (mammary, urogenital), palentine rugae, tongue, palates (hard and soft), larynx, epiglottis, trachea, heart, thymus, thyroid, brain, lungs, diaphragm, kidneys, large intestine, small intestine, stomach, rectum, spleen, urinary bladder, pancreas, gall bladder, liver, esophagus, external genital opening (female and male), anus, penis, scrotum, umbilical cord**