Biology

State Standard Number	State Standard Area / Description	Unit Name	Course Topic Description
1	Apply inquiry-based and problem-solving processes and skills to scientific investigations.		
1.a	Conduct a scientific investigation demonstrating safe procedures and proper care of laboratory equipment.	Nature of Science	Scientific Method Lab
1.a.1	Safety rules and symbols		
1.a.2	Proper use and care of the compound light microscope, slides, chemicals, etc.		
1.a.3	Accuracy and precision in using graduated cylinders, balances, beakers, thermometers, and rulers		
1.b	Formulate questions that can be answered through research and experimental design.		
1.c	Apply the components of scientific processes and methods in classroom and laboratory investigations (e.g., hypotheses, experimental design, observations, data analyses, interpretations, theory development).		
1.d	Construct and analyze graphs (e.g., plotting points, labeling x-and y-axis, creating appropriate titles and legends for circle, bar, and line graphs).	Nature of Science	Scientific Method Lab
1.e	Analyze procedures, data, and conclusions to determine the scientific validity of research.	Nature of Science	Scientific Method Lab

Biology

1.f	Recognize and analyze alternative explanations for experimental results and to make predictions based on observations and prior knowledge.	Nature of Science	Scienitific Method Lab
1.g	Communicate and defend a scientific argument in oral, written, and graphic form.		
2	Describe the biochemical basis of life and explain how energy flows within and between the living systems.		
2.a	Explain and compare with the use of examples the types of bond formation (e.g., covalent, ionic, hydrogen, etc.) between or among atoms.	Nature of Science	Section 2, Part 5
2.a.1	Subatomic particles and arrangement in atoms	Nature of Science	Section 2, Parts 2-3
2.a.2	Importance of ions in biological processes		
2.b	Develop a logical argument defending water as an essential component of living systems (e.g., unique bonding and properties including polarity, high specific heat, surface tension, hydrogen bonding, adhesion, cohesion, and expansion upon freezing).	Nature of Science	Section 2, Parts 9-10

Biology

2.c	Classify solutions as acidic, basic, or neutral and relate the significance of the pH scale on an organism's survival (e.g., consequences of having different concentrations of hydrogen and hydroxide ions).	Nature of Science	Section 2, Part 11
2.d	Compare and contrast the structure, properties, and principal functions of carbohydrates, lipids, proteins, and nucleic acids in living organisms.	Nature of Science	Section 2, Parts 14-21
2.d.1	Basic chemical composition of each group	Nature of Science	Section 2, Parts 14-21
2.d.2	Building components of each group (e.g., amino acids, monosaccharides, nucleotides, etc.)	Nature of Science	Section 2, Parts 14-21
2.d.3	Basic functions (e.g., energy, storage, cellular, heredity) of each group	Nature of Science	Section 2, Parts 14-21
2.e	Examine the life processes to conclude the role enzymes play in regulating biochemical reactions.	Photosynthesis and Cellular Respiration	Section 1, Parts 6-8
2.e.1	Enzyme structure	Photosynthesis and Cellular Respiration	Section 1, Parts 6-8
2.e.2	Enzyme function, including enzyme-substrate specificity and factors that effect enzyme function (pH and temperature)	Photosynthesis and Cellular Respiration	Section 1, Parts 6-8

Biology

2.f	Describe the role of adenosine triphosphate (ATP) in making energy available to cells.	Photosynthesis and Cellular Respiration	Section 1, Part 10
2.f.1	ATP structure	Photosynthesis and Cellular Respiration	Section 1, Part 10
2.f.2	ATP function	Photosynthesis and Cellular Respiration	Section 1, Part 10
2.g	Analyze and explain the biochemical process of photosynthesis and cellular respiration and draw conclusions about the roles of the reactant and products in each.	Photosynthesis and Cellular Respiration	Covered throughout entire unit
2.g.1	Photosynthesis and respiration (reactants and products)	Photosynthesis and Cellular Respiration	Section 2, Part 1 Section 3, Part 1
2.g.2	Light-dependent reactions and light independent reactions in photosynthesis, including requirements and products of each	Photosynthesis and Cellular Respiration	All of Section 2
2.g.3	Aerobic and anaerobic processes in cellular respiration, including products each and energy differences	Photosynthesis and Cellular Respiration	All of Section 3
3	Investigate and evaluate the interaction between living organisms and their environment.		

Biology

3.a	Compare and contrast the characteristics of the world's major biomes (e.g., deserts, tundra, taiga, grassland, temperate forest, tropical rainforest).	Ecology	Biomes Lab
3.a.1	Plant and animal species	Ecology	Biomes Lab
3.a.2	Climate (temperature and rainfall)	Ecology	Biomes Lab
3.a.3	Adaptations of organisms	Ecology	Biomes Lab
3.b	Provide examples to justify the interdependence among environmental elements.	Ecology	Section 2, Part 6
3.b.1	Biotic and abiotic factors in an ecosystem (e.g., water, carbon, oxygen, mold, leaves)	Ecology	Section 2, Part 6
3.b.2	Energy flow in ecosystems (e.g., energy pyramids and photosynthetic organisms to herbivores, carnivores, and decomposers)	Ecology	Section 2, Parts 7-9
3.b.3	Roles of beneficial bacteria		
3.b.4	Interrelationships of organisms (e.g., cooperation, predation, parasitism, commensalism, symbiosis, and mutualism)	Ecology	Section 1, Part 5
3.c	Examine and evaluate the significance of natural events and human activities on major ecosystems (e.g., succession, population growth, technology, loss	Ecology	Section 3, Parts 6-22

Biology

	of genetic diversity, consumption of resources).		
4	Analyze and explain the structures and function of the levels of biological organization.		
4.a	Differentiate among plant and animal cells and eukaryotic and prokaryotic cells.	Cell Structure	Section 1, Parts 5 and 8-9
4.a.1	Functions of all major cell organelles and structures (e.g., nucleus, mitochondrion, rough ER, smooth ER, ribosomes, Golgi bodies, vesicles, lysosomes, vacuoles, microtubules, microfiliaments, chloroplast, cytoskeleton, centrioles, nucleolus, chromosomes, nuclear membrane, cell wall, cell membrane [active and passive transport], cytosol)	Cell Structure	Section 2, Part 1 (tutorial)
4.a.2	Components of mobility (e.g., cilia, flagella, pseudopodia)		
4.b	Differentiate between types of cellular reproduction.	Cell Structure	Section 2, Part 1 (tutorial)
4.b.1	Main events in the cell cycle and cell mitosis (including differences in plant and animal cell divisions)	Cell Structure	Section 3, Part 2 (tutorial)
4.b.2	Binary fission (e.g., budding, vegetative propagation, etc.)	Cell Structure	Section 3, Part 2 (tutorial)
4.b.3	Significance of meiosis in sexual reproduction	Cell Structure	All of Section 4

Biology

4.b.4	Significance of crossing over	Cell Structure	Section 4, Part 6
4.c	Describe and differentiate among the organizational levels of organisms (e.g., cells, tissues, organs, systems, types of tissues.)	Animal Organization	Intro
4.d	Explain and describe how plant structures (vascular and nonvascular) and cellular functions are related to the survival of plants (e.g., movement of materials, plant reproduction).	Plant Structure	Covered over entire unit
5	Demonstrate an understanding of the molecular basis of heredity.		
5.a	Analyze and explain the molecular basis of heredity and the inheritance of traits to successive generations by using the Central Dogma of Molecular Biology.	Genetics	Throughout entire unit
5.a.1	Structures of DNA and RNA	Genetics	DNA Lab RNA Lab
5.a.2	Processes of replication, transcription, and translation	Genetics	All of Section 5
5.a.3	Messenger RNA codon charts	Genetics	RNA Lab
5.b	Utilize Mendel's laws to evaluate the results of monohybrid Punnett squares involving complete dominance, incomplete dominance, codominance, sex linked, and multiple alleles (including outcome percentage of both genotypes and phenotypes.)		

Biology

5.c	Examine inheritance patterns using current technology (e.g., pedigrees, karyotypes, gel electrophoresis).		
5.d	Discuss the characteristics and implications of both chromosomal and gene mutations.	Genetics	Section 2, Part 13
5.d.1	Significance of nondisjunction, deletion, substitutions, translocation, frame shift mutation in animals	Genetics	Section 5, Part 5
5.d.2	Occurrence and significance of genetic disorders such as sickle cell anemia, Tay-Sachs disorder, cystic fibrosis, hemophilia, Downs Syndrome, color blindness	Genetics	Section 2, Parts 6-15
6	Demonstrate an understanding of principles that explain the diversity of life and biological evolution.		
6.a	Draw conclusions about how organisms are classified into a hierarchy of groups and subgroups based on similarities that reflect their evolutionary relationships.	Biological Diversity	Section 1, Parts 5-6
6.a.1	Characteristics of the six kingdoms	Biological Diversity	Section 1, Parts 8-14
6.a.2	Major levels in the hierarchy of taxa (e.g., kingdom, phylum/division, class, order, family, genus, and species)	Biological Diversity	Section 1, Part 1
6.a.3	Body plans (symmetry)		
6.a.4	Methods of sexual reproduction (e.g., conjugation, fertilization, pollination)		

Biology

6.a.5	Methods of asexual reproduction (e.g., budding, binary fission, regeneration, spore formation)		
6.b	Critique data (e.g., comparative anatomy, Biogeography, molecular biology, fossil record, etc.) used by scientists (e.g., Redi, Needham, Spallanzani, Pasteur) to develop an understanding of evolutionary processes and patterns.	Evolution	Evolution Lab
6.c	Research and summarize the contributions of scientists, (including Darwin, Malthus, Wallace, Lamarck, and Lyell) whose work led to the development of the theory of evolution.		
6.d	Analyze and explain the roles of natural selection, including the mechanisms of speciation (e.g., mutations, adaptations, geographic isolation) and applications of speciation (e.g., pesticide and antibiotic resistance).	Evolution	Section 2, Parts 4-8
6.e	Differentiate among chemical evolution, organic evolution, and the evolutionary steps along the way to aerobic heterotrophs and photosynthetic autotrophs.		