COMPONENT	OBJECTIVES	COMPETENCY
I Science Skills and Attitudes, Applications, and Contexts of Biology	1. Use careful observations and exploratory activities to identify variables and develop problem statements. **(SC.H.1.4.1)** 2. Distinguish among descriptive (laboratory and field observations), comparative (comparing two experiments with one common manipulated variable), and experimental (controlled experiment) investigation designs commonly used in the biological sciences. **(SC.H.1.4.1) (SC.H.3.4.1)** 3. Write hypotheses leading to different types of experimental designs for selected problem statements using variables identified as manipulated (independent) and responding (dependent). **(SC.H.1.4.0)** 4. Routinely analyze experiments in terms of: problem statement, hypotheses, manipulated and responding variables, quantification of variables, identification of variables held constant, the number of tests and trials, and the use of an experimental control. **(SC.H.2.4.2)** 5. Based upon an appropriate number of experimental trials and samples, systematically collect and organize data into tables or charts and properly distinguish among the types of qualitative (nominal and ordinal) and quantitative (interval and ratio) data analyzed. **(SC.H.1.4.0)** 6. Interpret experimental data by reordering and/or plotting graphs and then describing the central tendency of the data by the appropriate use of the mean, median, and/or mode and the variation of the data by the appropriate use of the range and/or the frequency distribution. **(SC.H.1.4.0)** 7. Write conclusions that cover the following seven points: state what was investigated; describe whether or not the hypothesis was supported by the results; include sample results; compare the results with other investigations; provide possible explanations about the results; recommend additional studies; and discuss possible applications. **(SC.H.1.4.3)**	A. Apply science investigation skills to design and carry out appropriate types of experiments and to analyze the data collected to form conclusions on biological topics using established laboratory and safety procedures.

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	8. Analyze conclusions by classifying each sentence as a statement based upon either: an observation, the result of information gathered thorough the senses; an inference, the explanation or interpretation of observations; a fact, the activities performed during the investigation; or an opinion, inferences not directly supported by observations. **(SC.H.1.4.7)** 9. Identify the parts, functions, proper care, and use of appropriate scientific equipment, e.g., microscopes and balances and demonstrate accurate metric measurement by reading common laboratory apparatus to the nearest unit of measure and describing the uncertainty of these measures. **(SC.H.1.4.0)** 10. Select attire (aprons, eye protection, containment of hair, clothes) to ensure personal protection and practice accepted safety procedures using appropriate science equipment for all science activities. **(SC.H.1.4.0)** 11. Identify appropriate safety procedures for typical laboratory emergencies such as, broken glass, chemical spills, chemical splashes on the skin or in the eye, and the prevention of fires. **(SC.H.1.4.0)** 12. Research, design, complete, and make an appropriate scientific report on the results of a long range experimental investigation on an suitable science topic.	

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	1. Describe how discoveries by biologists can have both beneficial and detrimental affects on the quality of human life. **(SC.H.3.4.5)** 2. Identify current problems caused by applied technology and economic pressures that might be solved by the application of biological knowledge, e.g., pesticides in the environment, genetic engineering, management of public lands and resources, and deforestation. **(SC.H.3.4.2) (SC.H.3.4.3)** 3. Use scientific knowledge and processes to distinguish between science and pseudo science. **(SC.H.1.4.4) (SC.H.1.4.6) (SC.H.1.4.7) (SC.H.3.4.4)** 4. Recognize the criteria that biologists use for judging the validity of scientific theories and that among scientists there are different interpretations of data. **(SC.H.1.4.5) (SC.H.1.4.6) (SC.H.1.4.7)** 5. Explore research and career opportunities in the field of biology. **(SC.H.3.4.6)** 6. Identify and describe the scientific contributions of biological researchers from various ethnic and cultural backgrounds and recognize the importance of the continuous development and sharing of scientific information. **(SC.H.1.4.1)**	B. Apply biological knowledge, principles and skills to clarify and make decisions involving critical social issues.

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	1. Research the development of Charles Darwin's theory of evolution and trace the social and scientific outcomes resulting from his theory. 2. Research the development of the germ theory of disease. 3. Research the effect of the microscope on the development of biological science.	C. Demonstrate the historical and social contexts of biological science and its relationships with other disciplines by describing an example for one the following: how a technological device has allowed scientists to extend our understanding of the natural world; how a biological science activity has influenced a political, economic, or cultural event or the reverse situation; or how biology is involved in the emergence of new fields of endeavor in the sciences.
II Cellular Structures and Functions	1. Identify the four major classes of biochemical compounds important to biological structures and metabolism, their common monomers, and their major role(s) in the cell. . **(SC.F.1.4.0) (SC.F.1.4.1) (SC.F.1.4.2) (SC.F.1.4.3)** 2. Describe the role of enzymes during anabolic and catabolic reactions including their specificity. **(SC.A.1.4.4) (SC.F.1.4.1) (SC.F.1.4.5)** 3. Describe how the ATP-ADP cycle powers the anabolic and catabolic reactions and its role in cellular processes such as digestion, protein synthesis, photosynthesis, and respiration.	A. Describe the role of enzymes and energy in the breaking down of biochemical compounds into component molecules and how they are reorganized into new molecules needed by the cell.
	1. Describe the processes that move molecules in living systems and their importance—diffusion, osmosis, and active transport. Include the direction of movement, types of substances moved and energy that drives each process. **SC.F.1.4.3** 2. Describe the basic process of photosynthesis and its importance in energy and chemical cycles, including the following: raw materials, forms of energy used and produced, chemical products, the role of chlorophyll, and the location of the process.	B. Relate the major cellular structures to the processes they perform.

COMPONENT	OBJECTIVES	COMPETENCY
	3. Describe the basic processes of anaerobic (fermentation and glycolysis) and aerobic respiration and their importance in energy and chemical cycles, including the following: raw materials, form and amounts of energy produced, chemical products, and the location of the processes. 4. Locate, identify the functions of, and describe how the following cell organelles or areas are adapted to carry out processes needed by the cell: nucleus, cytoplasm, cell membrane, nuclear membrane, chromosome, ribosomes, mitochondrion, plastid, lysosomes, vacuoles, endoplasmic reticulum, Golgi apparatus, and cell wall. **(SC.F.1.4.0) (SC.F.1.4.3)**	
III Cell Reproduction and Mendelian Genetics	1. Identify the functions of cell division in unicellular and multicellular organisms, e.g., reproduction, repair and growth. **(SC.F.1.4.5)** 2. Identify the relationship between DNA and the chromosomes in the process of cellular reproduction. 3. Compare mitosis and meiosis with regard to chromosome number in parent cells versus daughter cells, types of cells produced, total number of cells produced, and the number of divisions.	A. Distinguish between the role of mitosis and cytokinesis, in growth, development, and the perpetuation of chromosome number and genetic identity; and the role of meiosis, as a reduction process maintaining the continuity of an organism's chromosome number from generation to generation.
	1. Identify Mendel's laws and relate them to inheritance of traits. **(SC.F.2.4.1)** 2. Distinguish between sex-linked and sex-influenced traits. **(SC.F.2.4.1)** 3. Identify the gene or chromosomal mutation involved in human disorders such as Down's syndrome, sickle-cell anemia, hemophilia and Tay-Sachs. **(SC.F.2.4.1)**	B. Relate the inheritance of traits to the genetic information contained in the DNA molecules and how this information is conveyed through chromosomes from one generation to the next.

COMPONENT	OBJECTIVES	COMPETENCY
	4. Use a Punnett square to solve monohybrid and dihybrid genetic problems involving complete dominance, incomplete dominance, sex determination, and sex-linked traits. **(SC.F.2.4.1)**	
IV The Evolution of Organisms	1. Describe the processes of adaptation and evolution using the tenants of Darwin (natural selection). **(SC.F.2.4.3)** 2. Explain how evidences such as fossils, biochemical similarities, homologous structures, are used to substantiate biological changes through time. **(SC.F.2.4.3)** 3. Explain several scientific explanations for the origin of life (abiogenesis and biogenesis). **(SC.F.2.4.3)** 4. Identify environmental factors that could influence natural selection and explain an example such as, climate, overpopulation, and pollution. **(SC.G.2.4.3)** 5. Outline the strengths and weaknesses of other current theories of the mechanisms for evolution, such as punctuated equilibria, endobioctytosis, and neoDarwinism.	A. Describe the purpose of the theory of evolution and use the mechanism of natural selection to explain how the theory of evolution accounts for the diversity of living and extinct species and yet produces the similarities within that diversity (convergent and divergent evolution).
V Ecology	1. Identify the biotic and abiotic components of an ecosystem and the importance of each in determining the organisms found in South Florida or other regions (biomes). **(SC.G.2.4.3)** 2. Describe how the interdependence of organisms in an ecosystem results in a relatively stable system that cycles around a state of equilibrium. **(SC.G.2.4.2)**	A. Describe characteristic abiotic and biotic components of a South Florida community and relate them to patterns of matter and energy cycling within the community using several types of food webs or food chains.

COMPONENT	OBJECTIVES	COMPETENCY
	3. Describe carbon, nitrogen, and water cycles and their importance to living things. **(SC.G.2.4.0)** 4. Construct and compare food chains and food webs. **(SC.G.1.4.1) (SC.G.1.4.2)** 5. Explain the ecological interactions demonstrated by symbiosis (mutualism, commensalism, parasitism, competition and predation). **(SC.G.1.4.1)**	
	1. Explain the role of limiting factors with respect to carrying capacity, using human population growth and quality of life as examples. **(SC.G.2.4.3)** 2. Describe and differentiate between primary and secondary succession, e.g., in a mangrove community. **(SC.G.2.4.4)** 3. Describe environmental problems such as: pollution and biological magnification of toxic substances facing South Florida, and generate possible solutions. **(SC.G.2.4.6)** 4. List ways in which certain types of pollution affect health and life span, the extinction of other animal and plant species, and the accelerated change to the environment leading to habitat loss or the creation of new habitats. **(SC.G.2.4.6)**	B. Describe how population growth and limiting environmental factors interact to produce a stable ecosystem and then how individual organisms and populations (including human technology) can upset the balance.

COMPONENT	OBJECTIVES	COMPETENCY
VI Diversity of Monerans, Protists, Fungi, Plants, and Animals	1. List in the proper order and describe the relationships among the levels of organization in living systems: organelle, cell, tissue, organ, system, organism, population, community, ecosystem, biosphere. **(SC.F.1.4.2)** 2. Recognize the need for a classification system and classify plants and animals based on structural characteristics, using a dichotomous taxonomic key. 3. Describe how the modern classification systems are based upon the theory of evolution through structure, function, biochemical make-up, embryonic development. **(SC.F.2.4.3)** 4. Identify a group of organisms as members of the same species, members of broader taxonomic groups, and describe the characteristics which determine their placement in the five kingdoms. **(SC.F.2.4.0)** 5. Compare and contrast structures and modes of reproduction of viruses, monerans, protists, and fungi. **(SC.F.2.4.1)** 6. Describe the characteristics of some pathogenic organisms, diseases caused by each, methods of transmission, effects upon the human body, and recognize tests used to identify bacteria. **(SC.G.1.4.1)** 7. Describe the role of antibiotics, vaccines, interferon in the control of diseases; and describe the antigen-antibody reaction explaining how it protects the body against foreign organisms and substances. 8. Contrast certain microbial processes as being helpful or harmful to humans or other organisms (disease, soil fertility, variety of food, fiber, decay, fermentation, toxin production, antibiotic production, and genetically engineered chemicals). **(SC.F.1.4.8)**	A. Correlate the diversity of representative monerans, protists, and fungi, to how their identifying characteristics help them to survive in different environments.

COMPONENT	OBJECTIVES	COMPETENCY
	1. Describe the structural characteristics of vascular and non vascular plants, including their adaptations to life on land. **(SC.F.2.4.3)** 2. Describe the structures and functions of roots, stems, flowers, leaves, fruits, seeds, xylem, and phloem. **(SC.F.1.4.2)** 3. Compare and contrast the characteristics of monocots and dicots. **(SC.G.1.4.1)** 4. Compare methods of reproduction in higher plants (gymnosperms and angiosperms) with lower plants (algae, mosses, liverworts, and ferns). **(SC.F.2.4.1)** 5. Identify various tropisms in plants and explain the role of plant hormones. **(SC.F.1.4.6) (SC.F.1.4.7)** 6. Investigate and describe the biological and economic importance of some vascular and non vascular plants. **(SC.G.1.4.1)** 7. Identify the essential features in the maintenance and propagation of plants.	B. Correlate the diversity of representative plants to how their identifying characteristics help them to survive in different environments.
	1. Describe the division of labor among cells and explain how it permits a higher degree of specialization among multicellular organisms. **(SC.F.1.4.2)** 2. Investigate and differentiate among the major distinguishing characteristics of the phyla Porifera, Coelenterata, Platyhelminthes, Nematode, and Annelida and relate how the characteristic structures of representative animals help them to survive in the environment.	C. Correlate the diversity of invertebrate organisms to how their identifying characteristics help their survival in different environments.

COMPONENT	OBJECTIVES	COMPETENCY
	3. Investigate and differentiate among the major distinguishing characteristics of the phyla Mollusca, Echinodermata and Arthropoda; identify examples of the major classes; and relate how the characteristic structures of representative animals help them to survive in the environment.	
	1. Investigate and differentiate among the major characteristics of subphylum vertebrata and relate how the characteristic structures of representative animals help them to survive in the environment. **(SC.F.2.4.3)** 2. Identify and differentiate the major characteristics of invertebrates and vertebrates including the types of symmetry. **(SC.F.1.4.2)** 3. Describe the characteristics of endotherms and ectotherms and list some adaptations of vertebrates and invertebrates which facilitate survival, including behavior. **(SC.F.1.4.2)** 4. Explain the relationships among the number of eggs, methods of fertilization, and rates of embryonic development as related to species survival (natural selection). **(SC.F.2.4.1)**	D. Correlate the diversity of vertebrate organisms to how their identifying characteristics help their survival in different environments.
	1. Correlate the major anatomical features and their primary physiology of the following human systems: skeletal, muscular, integumentary, circulatory, immune, respiratory, digestive, excretory, nervous, endocrine, and reproductive systems to other animal systems. **(SC.F.1.4.2)** 2. Describe the homeostatic processes of breathing rate and maintenance of body temperature. **(SC.F.1.4.2)**	E. Correlate the major anatomical and physiological components of the systems of the human body to other appropriate animal systems.

COMPONENT	OBJECTIVES	COMPETENCY
	3. Describe the interaction between the nervous system and the endocrine system in coordinating and producing most body functions and external actions to cope with changes in the environment. **(SC.F.1.4.5) (SC.F.1.4.6) (SC.F.1.4.7) (SC.F.1.4.8)** 4. Describe the function of the immune system in protecting the body against microscopic agents or organisms and against cancer cells. **(SC.F.1.4.5) (SC.F.1.4.6) (SC.F.1.4.7) (SC.F.1.4.8)** 5. Identify types of diseases and/or disorders and list their effects upon the human body (degenerative, deficiency, hereditary, and contagious). **(SC.F.1.4.7) (SC.F.1.4.8)**	