

PISD Curriculum – Vertical Alignment of Science TEKS

High School – Biology

1	For at least 40% of instructional time, conducts field and laboratory investigations using safe, environmentally appropriate, and ethical practices.
1A Tested	Demonstrate safe practices during field and laboratory investigations such as outlined in the Texas Science Safety Standards.
1B Not Tested	Make wise choices in the use and conservation of resources and the disposal or recycling of materials.
2	Uses scientific methods during fields & laboratory investigations.
2A Tested	Plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology.
2B Tested	Collect data and make measurements with precision including constructing data tables, ability to read a meniscus on a graduated cylinder, ability to use a metric ruler and triple beam balance to understand the importance of scale. TEACHER NOTE: Discuss the difference between precision and accuracy.
2C Tested	Organize, analyze, evaluate, make inferences, and predict trends from data including tables, charts and graphs. TEACHER NOTE – have students read literature on current events and discuss them. Make sure the students know which graph type is most appropriate for the data.
2D Tested	Communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.
3	Uses critical thinking and scientific problem solving to make informed decisions.
3A Tested	Analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information. TEACHER NOTE – can use debates on current topics and reading/discussing current events.
3B Tested	Evaluate promotional claims that relate to biological issues such as product labeling and advertisements.
3C Not Tested	Evaluate the impact of research on scientific thought, society, and the environment such as stem cell research and vaccinations (polio and HPV).
3D Not Tested	Describe connection between biology and future careers.

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3E Not Tested	Evaluate models according to their adequacy in representing biological objects or events.
3F Not Tested	Research and describe the history of biology and contributions of scientists such as Charles Darwin, Carl Linnaeus, Gregor Mendel, James Watson, Francis Crick, Rosalind Franklin, Jonas Salk, and Louis Pasteur.
4	The student knows that cells are the basic structures of all living things and have specialized parts that perform specific functions, and that viruses are different from cells and have different properties and functions.
4A Not Tested	Identify the parts of prokaryotic and eukaryotic cells. Including --- Summarize the cell theory --- Identify and describe all cellular structures and their functions --- Distinguish between plant cells from animal cells
4B Tested	Investigate and identify cellular processes. Including --- Homeostasis --- Permeability --- Energy production (ADP, ATP) --- Transportation of molecules <ul style="list-style-type: none"> • Active • Passive • Facilitated diffusion --- Disposal of wastes --- Identify and describe the properties of water in solution including polarity in relation to living organisms (isotonic, hypertonic, hypotonic) --- Function of Cellular parts such as nucleus, mitochondria, chloroplast, ribosome, and cell membrane --- Synthesis of new molecules <ul style="list-style-type: none"> • Protein synthesis
4C Tested	Compare the structures and functions of viruses to cells and describe the role of viruses in causing diseases and conditions including --- distinguishing a vaccination vs. an antibiotic --- distinguishing living vs. nonliving. Such as <ul style="list-style-type: none"> • Acquired immune deficiency syndrome • Common colds • Smallpox • Influenza • Warts • Bacteriophages • Rabies • Chicken pox • Hepatitis • Polio • Viral replication (lytic, lysogenic)

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<p>4D Tested</p>	<p>Identify and describe the role of bacteria in maintaining health. Such as</p> <p>--- Digestion</p> <p>--- Decomposition</p> <p>--- Food production</p> <p>--- Medication</p> <p>--- Causing disease, such as in</p> <ul style="list-style-type: none"> • Streptococcus infections • Staphylococcus infections • Diphtheria <p>--- Other important related objectives:</p> <ul style="list-style-type: none"> • Identify the three shapes of bacteria Describe the role of bacteria in maintaining health in the digestive systems and other parts of the body • Identify ways that the body fights infectious bacteria • Describe how antibiotics can be used to fight bacteria • Describe how some bacteria can become resistant to antibiotics
<p>5 The student knows how an organism grows and how specialized cells, tissues, and organs develop.</p>	
<p>5A Not Tested</p>	<p>Compare cells from different parts of plants and animals to show specialization of structure and function. Including</p> <p>--- Plant</p> <ul style="list-style-type: none"> • Roots • Stems • Leaves • Flowers • Seeds • Cones <p>--- Animal</p> <ul style="list-style-type: none"> • Epithelia • Muscles • Connective (such as bone) • Nerve
<p>5B Not Tested</p>	<p>Identify cell differentiation in the development of organisms. Including</p> <p>--- Embryonic development</p> <ul style="list-style-type: none"> • Ectoderm • Mesoderm • Endoderm
<p>5C Not Tested</p>	<p>Sequence the levels of organization in multicellular organisms to relate the parts to each other and to the whole. Including (in sequence)</p> <p>--- Atom, Molecule, Organelle, Cell, Tissue, Organ, Organ system, Organism, Population, Community, Ecosystem, Biome, Biosphere</p>

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6	The student knows the structures and functions of nucleic acids in the mechanisms of genetics.
6A Tested	Describe components of deoxyribonucleic acid (DNA), and illustrate how information for specifying the traits of an organism is carried in the DNA. Including --- Structure of a DNA molecule <ul style="list-style-type: none"> • Shape • Antiparallel structure (i.e. 3' to 5', 5' to 3') • Type of sugar • Nitrogen bases • Phosphates • Hydrogen bonds --- Recognize the significance of nucleotide sequence in determining traits --- Genes that are found on chromosomes, code for proteins
6B Tested	Explain replication, transcription, and translation using models of DNA and ribonucleic acid (RNA). Including --- Base pair sequences (codon anti-codon relationship) --- Describe the steps in DNA replication --- Differentiate among mRNA, tRNA, and rRNA --- Describe the steps of transcription and its purpose --- Describe the steps of translation and its role in protein synthesis --- Differentiate between transcription and translation --- Interpret a codon chart for translation
6C Tested	Identify and illustrate how changes in DNA cause mutations and evaluate the significance of these changes. Including --- Identify mutations occur in base sequence such as <ul style="list-style-type: none"> • Insertion • Deletion • Frame shift • Translocation --- Compare normal karyotype to abnormal karyotype --- Analyze a pedigree --- Describe the causes and results of several human genetic disorders such as sex-linked, nondisjunction, dominant and recessive. The disorders include <ul style="list-style-type: none"> • Albinism • PKU • Hemophilia • Colorblindness • Down's syndrome
6D Tested	Compare genetic variations observed in plants and animals. Including --- Describe Gregor Mendel's work with pea plants --- Explain Mendel's three conclusions: <ul style="list-style-type: none"> • Principle of dominance • Law of segregation • Law of independent assortment --- Solve single-trait and double-trait genetic problems, using Punnett squares --- Blood Type and Rh Factor --- Explain the difference between genotype and phenotype

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<p>6E Not Tested</p>	<p>Compare the processes of mitosis and meiosis and their significance to sexual and asexual reproduction. Including --- Describe the process of mitosis (cell division) • Cell cycle --- Recognize the role of mitosis in the production of somatic cells --- Relate DNA replication to cell division --- Describe the process of meiosis --- Recognize the role of meiosis in haploid gametes (gametogenesis) --- Describe cancer as uncontrolled cell division</p>
<p>7 The student knows the theory of biological evolution.</p>	
<p>7A Tested</p>	<p>Identify evidence of change in species. Including --- Fossils --- DNA sequences such as Cytochrome C --- Anatomical similarities • Analogous • Homologous • Vestigial -- Physiological similarities • Cladistics --- Embryology</p>
<p>7B Tested</p>	<p>Illustrate the results of natural selection. Including --- Adaptation • Selective advantage --- Speciation • Geographic isolation • Reproductive isolation • Convergent evolution • Divergent evolution • such as Darwin’s finches --- Diversity (biodiversity) --- Phylogeny --- Behavior • Instincts --- Extinction --- Population genetics(such as Hardy-Weinberg)</p>

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8	The student knows applications of taxonomy and can identify its limitations.
8A Not Tested	Collect and classify organisms at several taxonomic levels. Such as --- All taxonomic domains to species <ul style="list-style-type: none"> • Species • Phylum • Kingdom -- Construct and/or use a dichotomous key --- Recognize binomial nomenclature
8B Not Tested	Analyze relationships among organisms and develop a model of a hierarchical classification system based on similarities and differences using taxonomic nomenclature. Including --- Phylogenetic tree --- Compare and contrast phylogenetic and cladistic trees
8C Tested	Identify characteristics of 6 kingdoms. Including --- Describe characteristics of domains and kingdoms using formal language <ul style="list-style-type: none"> • Type of cell • Feeding type • Form of reproduction --- Monerans (outdated term) <ul style="list-style-type: none"> • Archaeobacteria • Eubacteria --- Protists (Protista) --- Fungi --- Plants (Plantae) --- Animal (Animalia)
9	The student knows metabolic processes and energy transfers that occur in living organisms.
9A Not Tested	Compare the structures and functions of different types of biomolecules. Including --- Carbohydrates <ul style="list-style-type: none"> • Recognize carbohydrates provide cellular energy, cell membrane functions and support. --- Lipids <ul style="list-style-type: none"> • Recognize phospholipids as the basic structure of cell membranes. --- Proteins <ul style="list-style-type: none"> • Recognize enzymes as the principal regulator of most chemical activity. • Recognize amino acids as the building blocks of proteins. • Recognize proteins are the “work horses” of the cell. --- Nucleic acids (DNA, RNA) --- Identify and describe the chemical elements in living matter (valence electrons, bonding, and periodic table information) <ul style="list-style-type: none"> • Carbon • Hydrogen • Oxygen • Nitrogen • Phosphorous

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<p>9B Not Tested</p>	<p>Compare the energy flow in photosynthesis to the energy flow in cellular respiration. Including</p> <ul style="list-style-type: none"> --- Distinguish between photosynthesis and cellular respiration. <ul style="list-style-type: none"> • Understand the chemical equation that represents photosynthesis and cellular respiration such as balancing the equation and that the products of one reaction is the reactants of the other. --- Relate the light-dependent reaction and the light independent reaction during photosynthesis to each other. --- Recognize process of glycolysis and the role of ATP such as ATP yields from photosynthesis and cellular respiration. --- Compare and contrast the processes, end products, and energy production in aerobic respiration and anaerobic respiration. <ul style="list-style-type: none"> • Lactic acid fermentation • Alcoholic fermentation
<p>9C Not Testable</p>	<p>Investigate and identify the effects of enzymes on food molecules. Including</p> <ul style="list-style-type: none"> --- Effect on rate of chemical reactions (such as pepsin or amylase) --- Not consumed and reusable --- pH scale and the effect of pH on enzyme action
<p>9D Tested</p>	<p>Analyze the flow of matter and energy through different trophic levels and between organisms and the physical environment. Including</p> <ul style="list-style-type: none"> --- Differentiate between autotrophs and heterotrophs <ul style="list-style-type: none"> • Chemoautotrophs --- Identify trophic levels <ul style="list-style-type: none"> • Autotrophs (producer) • Heterotrophs (primary and secondary consumers) --- Explain the flow of energy in ecosystems including: <ul style="list-style-type: none"> • Food chains • Food webs • Energy pyramids • Biomass pyramids --- Calculate the amount of biomass at each trophic level (10% rule) using a pyramid of energy.
<p>10</p>	<p>The student knows that, at all levels of nature, living systems are found within other living systems, each with its own boundary and limits.</p>
<p>10A Tested</p>	<p>Interpret the functions of systems in organisms. Including</p> <ul style="list-style-type: none"> --- Circulatory --- Digestive --- Nervous --- Endocrine --- Reproductive --- Integumentary --- Skeletal --- Respiratory --- Muscular --- Excretory --- Immune

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10B Tested	Compare the interrelationships of organ systems to each other and to the body as a whole. Including --- hormones and the autonomic nervous system.
10C Not Tested	Analyze and identify characteristics of plant systems and subsystems. Including --- Vascular system --- Non Vascular system --- Roots --- Xylem --- Phloem --- Cuticle --- Stoma --- Guard cell
11 The student knows that organisms maintain homeostasis.	
11A Not Tested	Identify and describe the relationships between internal feedback mechanisms in the maintenance of homeostasis. Including --- Change in heart rate --- Osmotic balance --- Body temperature --- Positive and negative feedback systems
11B Not Tested	Investigate and identify how organisms respond to external stimuli. Including --- Humans --- Animals • Sensory input --- Plants • tropisms
11C Not Tested	Analyze the importance of nutrition, environmental conditions, and physical exercise on health. Including --- vitamin deficiencies like scurvy and rickets --- circadian cycle --- the use of cardiovascular exercise in the maintenance of musculoskeletal system
11D Not Tested	Summarize the role of microorganisms in maintaining and disrupting equilibrium. Including --- Diseases in plants and animals (bacterial & viral) --- Decaying process in an ecosystem TEACHER NOTE: Mention positive roles of microorganisms such as lactobacillus in the intestinal tract or nitrogen fixation, etc.

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12	<p>The student knows that interdependence and interactions occur within an ecosystem.</p>
12A Not Tested	<p>Analyze the flow of energy through various cycles. Including</p> <ul style="list-style-type: none"> --- Carbon --- Oxygen --- Nitrogen --- Water cycles <p>TEACHER’S NOTE: Look at the flow of matter in the cycle, not so much energy.</p>
12B Tested	<p>Interpret interactions among organisms exhibiting predation, parasitism, commensalism, and mutualism. Including</p> <ul style="list-style-type: none"> --- benefit analysis and energy flow
12C Not Tested	<p>Compare variations, tolerances, and adaptations of plants and animals in different biomes. Including</p> <ul style="list-style-type: none"> --- Speciation --- Niche --- Ecosystem --- Extinction --- Abiotic and biotic factors
12D Not Tested	<p>Identify and illustrate that long-term survival of species is dependent on a resource base that may be limited. Including</p> <ul style="list-style-type: none"> --- Describe the effect of a limiting factor on a population of organisms. <ul style="list-style-type: none"> • Food • Water • Shelter • Space
12E Tested	<p>Investigate and explain the interactions in an ecosystem. Including</p> <ul style="list-style-type: none"> --- Food chains --- Food webs --- Food pyramids (ecological pyramids) --- Autotrophs (producers) --- Heterotrophs (consumers) --- Herbivores --- Carnivores --- Omnivores --- Decomposer

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13	The student knows the significance of plants in the environment.
13A Tested	Evaluate the significance of structural and physiological adaptations of plants to their environments. Including --- Vascular tissue --- Seeds --- Leaves --- Roots
13B Not Tested	Survey and identify methods of reproduction, growth, and development of various types of plants. Including --- Sexual and asexual --- Alternation of generations --- Nonvascular --- Vascular <ul style="list-style-type: none"> • Angiosperms • Gymnosperms --- Growth <ul style="list-style-type: none"> • Hormone regulation (Auxin) • Apical meristem --- Monocot and Dicot

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