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| <p align="center"><b>California Science Standards</b><br/> <i>The most important standards for ALL of our students.</i></p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <p align="center"><b>Biology/Life Sciences</b></p>                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <p align="center"><b>Cell Biology</b></p>                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 1.                                                                                                                          | <p>The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells. As a basis for understanding this concept:</p> <p><i>a. Students know</i> cells are enclosed within semipermeable membranes that regulate their interaction with their surroundings.</p> <p><i>b. Students know</i> enzymes are proteins that catalyze biochemical reactions without altering the reaction equilibrium and the activities of enzymes depend on the temperature, ionic conditions, and the pH of the surroundings.</p> <p><i>c. Students know</i> how prokaryotic cells, eukaryotic cells (including those from plants and animals), and viruses differ in complexity and general structure.</p> <p><i>e. Students know</i> the role of the endoplasmic reticulum and Golgi apparatus in the secretion of proteins.</p> <p><i>f. Students know</i> usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide.</p> <p><i>g. Students know</i> the role of the mitochondria in making stored chemical-bond energy available to cells by completing the breakdown of glucose to carbon dioxide.</p> <p><i>h. Students know</i> most macromolecules (polysaccharides, nucleic acids, proteins, lipids) in cells and organisms are synthesized from a small collection of simple precursors.</p> |
| <p align="center"><b>Genetics</b></p>                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                             | <p><i>b. Students know</i> only certain cells in a multicellular organism undergo meiosis.</p> <p><i>d. Students know</i> new combinations of alleles may be generated in a zygote through the fusion of male and female gametes (fertilization).</p> <p><i>e. Students know</i> why approximately half of an individual's DNA sequence comes from each parent.</p> <p><i>f. Students know</i> the role of chromosomes in determining an individual's sex.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 3.                                                                                                                          | <p>A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization. As a basis for understanding this concept:</p> <p><i>a. Students know</i> how to predict the probable outcome of phenotypes in a genetic cross from the genotypes of the parents and mode of inheritance (autosomal or X-linked, dominant or recessive).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 5.                                                                                                                          | <p>The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:</p> <p><i>a. Students know</i> the general structures and functions of DNA, RNA, and protein.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <p align="center"><b>Ecology</b></p>                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 6.                                                                                                                          | <p>Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept:</p> <p><i>a. Students know</i> biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.</p> <p><i>b. Students know</i> how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.</p> <p><i>c. Students know</i> how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.</p> <p><i>d. Students know</i> how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration.</p> <p><i>e. Students know</i> a vital part of an ecosystem is the stability of its producers and decomposers.</p> <p><i>f. Students know</i> at each link in a food web some energy is stored in newly made structures but much energy is dissipated into the environment as heat. This dissipation may be represented in an energy pyramid.</p>                                                                                                                                                                                                                                                         |

## California Science Standards

*The most important standards for ALL of our students.*

### **Biology/Life Sciences (Cont'd)**

#### Evolution

7. The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time. As a basis for understanding this concept:
- a. Students know why natural selection acts on the phenotype rather than the genotype of an organism.*
  - b. Students know why alleles that are lethal in a homozygous individual may be carried in a heterozygote and thus maintained in a gene pool.*
  - c. Students know new mutations are constantly being generated in a gene pool.*
8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:
- b. Students know a great diversity of species increases the chance that at least some organisms survive major changes in the environment.*
  - d. Students know reproductive or geographic isolation affects speciation.*
  - e. Students know how to analyze fossil evidence with regard to biological diversity, episodic speciation, and mass extinction.*

#### Physiology

10. Organisms have a variety of mechanisms to combat disease. As a basis for understanding the human immune response:
- b. Students know the role of antibodies in the body's response to infection.*
  - c. Students know how vaccination protects an individual from infectious diseases.*
  - d. Students know there are important differences between bacteria and viruses with respect to their requirements for growth and replication, the body's primary defenses against bacterial and viral infections, and effective treatments of these infections.*