long beach unified school district

OFFICE OF CURRICULUM, INSTRUCTION, & PROFESSIONAL DEVELOPMENT

HIGH SCHOOL COURSE OUTLINE

(Revised March 2006)

Course Code	4001	**Course Title**	Life Science 1-2		
Department	Science	**Short Title**	Life Sci 1-2		
Course Length	2 semesters	**Grade**	9 -12	**Credits/Semester**	5
Required for Graduation	Yes	**Meets H.S. Grad Requirement**	Yes	**Elective Credit**	
Meets UC "a-g" Requirement	No	**Meets NCAA Requirement**	No		
Prerequisites	None				

COURSE DESCRIPTION:

This course is a standards-based study of living things: origins, structures, functions, heredity, growth and development, interactions among, and behavior of living things. Content is built around major biological concepts such as biochemistry and the biology of cells, genetics, evolution, ecology, physiologic systems, and the diversity of living things. Concepts and skills are reinforced by hands-on laboratory experiences and the integration of other branches of science. Applications to society, individuals, and the utilization of technology are included, as is consideration of the impact of human activity on biological systems. Life Science 1-2 fulfills the life science high school graduation requirement. However, it does not meet the UC/CSU "d" laboratory science or "g" elective requirements. A course in the physical sciences is also needed to complete the minimum science graduation requirement for high school.

GOALS: (Student needs the course is intended to meet)

- Students will learn most of the required California State Standards for Biology/Life Sciences. The use of well-designed, memorable experiences and the application of scientific knowledge and methodology are essential in helping students achieve appropriate comprehension of the content.
- Students will improve their ability to learn independently by drawing generalizations from science related articles, books, graphs, charts, and diagrams. Regular opportunities are provided for students to clearly communicate their understanding through oral and written explanations of science concepts.
- Students will study the applications of biology to ecological, medical, commercial, and ethical issues to develop critical thinking skills, as they apply to decision making in both societal and personal contexts. This will inspire students to consider pursuing advanced studies in science and the wide variety of related career choices.

CA CONTENT STANDARDS:

Grade 9-12 Biology/Life Sciences:

Standards without asterisks represent those that all students are expected to achieve in the course of their studies. Standards with asterisks represent those that all students should have the opportunity to learn.

Cell Biology ..... (15% of CST)

1. 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, students know:

   a. cells are enclosed within semipermeable membranes that regulate their interaction with their surroundings. (CST, LS10)

   b. enzymes are proteins and 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. (CST)

   c. how prokaryotic cells, eukaryotic cells (including those from plants and animals), and viruses differ in complexity and general structure. (CST, LS10)

   d. the Central Dogma of molecular biology outlines the flow of information from transcription of ribonucleic acid (RNA) in the nucleus to translation of proteins on ribosomes in the cytoplasm. (CST)

   e. the role of the endoplasmic reticulum and Golgi apparatus in the secretion of proteins. (CST)

   f. usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide. (CST, LS10)

   g. the role of the mitochondria in making stored chemical bond energy available to cells by completing the breakdown of glucose to carbon dioxide. (CST)

   h. most macromolecules (polysaccharides, nucleic acids, proteins, lipids) in cells and organisms are synthesized from a small collection of simple precursors. (CST)

   i. how chemiosmotic gradients in the mitochondria and chloroplast store energy for ATP production.*

   j how eukaryotic cells are given shape and internal organization by a cytoskeleton or cell wall or both.*

Genetics ..... (30% of CST)

2. Mutation and sexual reproduction lead to genetic variation in a population. As a basis for understanding this concept, students know:

   a. meiosis is an early step in sexual reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each type. (CST)

   b. only certain cells in a multicellular organism undergo meiosis (CST, LS10)

   c. how random chromosome segregation explains the probability that a particular allele will be in a gamete. (CST)

   d. new combinations of alleles may be generated in a zygote through the fusion of male and female gametes (fertilization). (CST, LS10)

   e. why approximately half of an individual's DNA sequence comes from each parent. (CST, LS10)

   f. the role of chromosomes in determining an individual's sex. (CST, LS10)

   g. how to predict possible combinations of alleles in a zygote from the genetic makeup of the parents. (CST)

3. 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, students know:

   a. 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). (CST, LS10)

   b. the genetic basis for Mendel's laws of segregation and independent assortment. (CST)

   c. how to predict the probable mode of inheritance from a pedigree diagram showing phenotypes.*

   d. how to use data on frequency of recombination at meiosis to estimate genetic distances between loci and to interpret genetic maps of chromosomes.*

4. Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism. As a basis for understanding this concept, students know:

   a. the general pathway by which ribosomes synthesize proteins, using tRNAs to translate genetic information in mRNA. (CST)

   b. how to apply the genetic coding rules to predict the sequence of amino acids from a sequence of codons in RNA. (CST)

   c. how mutations in the DNA sequence of a gene may or may not affect the expression of the gene or the sequence of amino acids in an encoded protein. (CST)

   d. specialization of cells in multicellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves. (CST)

   e. proteins can differ from one another in the number and sequence of amino acids. (CST)

   f. why proteins having different amino acid sequences typically have different shapes and chemical properties.*

5. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept, students know:

   a. the general structures and functions of DNA, RNA, and protein. (CST, LS10)

   b. how to apply base-pairing rules to explain precise copying of DNA during semiconservative replication and transcription of information from DNA into mRNA. (CST)

   c. how genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products. (CST)

   d. how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, ligation, and transformation) is used to construct recombinant DNA molecules.*

   e. how exogenous DNA can be inserted into bacterial cells to alter their genetic makeup and support expression of new protein products.*

Ecology ..... (11.7% of CST)

6. Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept, students know:

   a. biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats. (CST, LS10)

   b. how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of non-native species, or changes in population size. (CST, LS10)

   c. how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death. (CST, LS10)

   d. how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration. (CST, LS10)

   e. a vital part of an ecosystem is the stability of its producers and decomposers. (CST, LS10)

   f. at each link in a food web some energy is stored in newly made structures but much is dissipated into the environment as heat. This dissipation may be represented in an energy pyramid. (CST, LS10)

   g. how to distinguish between the accommodation of an individual organism to its environment and the gradual adaptation of a lineage of organisms through genetic change.*

Evolution ..... (15% of CST)

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, students know:

   a. why natural selection acts on the phenotype rather than the genotype of an organism. (CST, LS10)

   b. why alleles that are lethal in a homozygous individual may be carried in a heterozygote and thus maintained in a gene pool. (CST, LS10)

   c. new mutations are constantly being generated in a gene pool. (CST, LS10)

   d variation within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions. (CST, LS10)

   e. the conditions for Hardy-Weinberg equilibrium in a population and why these conditions are not likely to appear in nature.*

f. how to solve the Hardy-Weinberg equation to predict the frequency of genotypes in a population, given the frequency of phenotypes.*

8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept, students know:

   a. how natural selection determines the differential survival of groups of organisms. (CST, LS10)

   b. a great diversity of species increases the chance that at least some organisms survive major changes in the environment. (CST, LS10)

   c. the effects of genetic drift on the diversity of organisms in a population. (CST)

   d. reproductive or geographic isolation affects speciation. (CST)

   e. how to analyze fossil evidence with regard to biological diversity, episodic speciation, and mass extinction. (CST, LS10)

   f. how to use comparative embryology, DNA or protein sequence comparisons, and other independent sources of data to create a branching diagram (cladogram) that shows probable evolutionary relationships.*

   g. how several independent molecular clocks, calibrated against each other and combined with evidence from the fossil record, can help to estimate how long ago various groups of organisms diverged evolutionarily from one another.*

Physiology ..... (18.3% of CST)

9. As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment. As a basis for understanding this concept, students know:

   a. how the complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide. (CST, LS10)

   b. how the nervous system mediates communication between different parts of the body and the body's interactions with the environment. (CST, LS10)

   c. how feedback loops in the nervous and endocrine systems regulate conditions in the body. (CST)

   d. the functions of the nervous system and the role of neurons in transmitting electrochemical impulses. (CST)

   e. the roles of sensory neurons, interneurons, and motor neurons in sensation, thought, and response. (CST)

   f. the individual functions and sites of secretion of digestive enzymes (amylases, proteases, nucleases, lipases), stomach acid, and bile salts.*

   g. the homeostatic role of the kidneys in the removal of nitrogenous wastes and the role of the liver in blood detoxification and glucose balance.*

   h. the cellular and molecular basis of muscle contraction, including the roles of actin, myosin, Ca^{+2}, and ATP.*

   i. how hormones (including digestive, reproductive, osmoregulatory) provide internal feedback mechanisms for homeostasis at the cellular level and in whole organisms.*

10. Organisms have a variety of mechanisms to combat disease. As a basis for understanding the human immune response, students know:

    a. the role of the skin in providing nonspecific defenses against infection. (CST)

    b. the role of antibodies in the body's response to infection. (CST, LS10)

    c. how vaccination protects an individual from infectious diseases. (CST, LS10)

    d. 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. (CST, LS10)

    e. why an individual with a compromised immune system (for example, a person with AIDS) may be unable to fight off and survive infections of microorganisms that are usually benign. (CST)

    f. the roles of phagocytes, B-lymphocytes, and T-lymphocytes in the immune system.*

Investigation and Experimentation ..... (10% of CST)

1. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations. Students will:

   a. select and use appropriate tools and technology (such as computer-linked probes, spread sheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data. (CST)

   b. identify and communicate sources of unavoidable experimental error. (CST)

   c. identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions. (CST, LS10)

   d. formulate explanations using logic and evidence. (CST)

   e. solve scientific problems using quadratic equations and simple trigonometric, exponential, and logarithmic functions. (CST)

   f. distinguish between hypothesis and theory as science terms. (CST, LS10)

   g. recognize the usefulness and limitations of models and theories as scientific representations of reality. (CST)

   h. read and interpret topographic and geologic maps. (CST)

   i. analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem). (CST, LS10)

   j. recognize the issues of statistical variability and the need for controlled tests. (CST, LS10)

   k. recognize the cumulative nature of scientific evidence. (CST)

   l. analyze situations and solve problems that require combining and applying concepts from more than one area of science. (CST)

   m. investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California. (CST)

   n. know that when an observation does not agree with an accepted scientific theory, the observation is sometimes mistaken or fraudulent (e.g., the Piltdown Man fossil or unidentified flying objects) and that the theory is sometimes wrong (e.g., the Ptolemaic model of the movement of the sun, moon and planets). (CST)

CST = Standards assessed on the California Standards Test
LS10 = Standards assessed on the 10th grade No Child Left Behind Biology/Life Science Test

DISTRICT PERFORMANCE STANDARDS:

The Long Beach Unified School District has common assessments and assignments that are required for Biology. The Performance Standard Criteria is shown in the table below. The objective is to have all students achieve at or above the Proficient Level and receive a C or better in the course. Performance level is determined by the average of the assessments or assignments.

Science Performance Standard Criteria

	Not Proficient	Partial Proficient	Proficient	Advanced Proficient
Graded Student Work	Average is a 1 or less than 60%	Average is a 2 or 60% - 69%	Average is a 3 or 70% - 84%	Average is a 4 or 85% - 100%
Standards-Based Classroom Assessments	Less than 60%	60% - 69%	70% - 84%	85% - 100%
Written Response / Lab Report / OES (6 point scale)	1-2	3	4	5-6
Written Response / Lab Report / OES (4 point scale)	1	2	3	4
End-Of-Course Exam	Less than 45%	45% - 59%	60% - 84%	85% - 100%

STATE PERFORMANCE STANDARDS:

The California State Board of Education has identified the following performance levels for the California Standards Test (CST) in Biology/Life Sciences. The objective of Long Beach Unified School District is to have all students achieve at or above the Proficient Performance Standard (Level). The table below indicates the estimated percent correct (based on 2003 LBUSD data) and the Scaled Score (SS) on the Content Standards Test.

Far Below Basic	Below Basic	Basic	Proficient	Advanced Proficient
Less than 28%	**28% - 37%**	**38% - 60%**	**60% - 79%**	**80% - 100%**
SS 150 – 275	**SS 276 – 299**	**SS 300 – 349**	**SS 350 – 393**	**SS 394 – 600**

OUTLINE OF CONTENT AND RECOMMENDED TIME ALLOTMENT:

The Task Analysis and Key Vocabulary presented here are drawn from the 2003 Science Framework for California Public Schools, which defines the intent and scope of the Science Content Standards. For additional information on the context and the benchmark standards to assess, refer to the Blueprints for the Biology Content Standards Test (CST) and the 10th Grade Life Sciences Test (LS10). Content sequencing, Labs/Demos, and time allocations are only suggestions and may be adjusted to suit school site curriculum plans, available materials, and student needs.

LIFE SCIENCE 1-2

Cell Biology

1. 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.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… cells are enclosed within semipermeable membranes that regulate their interaction with their surroundings. **(1,a)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Describe how phospholipids are organized to form a fluid mosaic cell membrane. • Describe the functions of proteins in the cell membrane. • Explain the difference between diffusion and osmosis. • Compare and contrast passive and active transport. * *Explain how large particles get into and out of cells. (LBUSD)*	**Glen. LS**, Ch 2:1 & 3:2	***KEY VOCABULARY:*** semipermeable, mosaic, membrane, diffusion, fluid, osmosis, exocytosis, endocytosis ***SKILLS FOCUS:*** microscopy, influence, recognition, observation ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • Glen. LS, Main Ideas Study Fold, p. 37 • Glen. LS, Mini Lab, "Observing Diffusion", p 75 • Glen. LS, Lab Demo, p 75 TE • Glen. LS, Activity, "Observing Osmosis", p 80	5 Days (2_ Blocks)
… enzymes are proteins and 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.**(1b)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Show that enzymes function as biological catalysts. They speed up spontaneous reactions by lowering the activation energy without being consumed. • Illustrate how protein shapes create the lock-and-key model of enzymes.	**Glen. LS**, Ch 3:1,3 (18:2 enzymes in digestion)	***KEY VOCABULARY:*** protein, spontaneous, enzyme, substrate, catalyst, concentration, activation energy ***SKILLS FOCUS:*** model, analyze, compare, predict, observe Formulate explanations by using logic and evidence. **(I&E 1.d)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • Glen. LS, Mini Lab, "Determining How Enzymes Work", p 71 • **Observing Catalysis** Observe catalase from liver homogenate or yeast reacting with peroxide substrate • **Reaction Rate Investigations** Have student groups choose different variables to investigate and share results with the rest of the class.	3 Days (1_ Blocks)

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… how prokaryotic cells, eukaryotic cells (including those from plants and animals), and viruses differ in complexity and general structure. **(1c)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	* *Describe five properties shared by all living organisms. (LBUSD)* • Explain why viruses cannot be considered as living organisms. • Distinguish prokaryotes and eukaryotes. • Describe how each organelle performs a task essential to the life of the cell. • Describe the composition of the nucleus. • Compare and contrast the structure of an animal cell with that of a plant cell. • State the three basic concepts included in the cell theory.	**Glen. LS**, Ch 1:2 and 2:1,3	***KEY VOCABULARY:*** prokaryotes, eukaryotes, virus, **ER**, **ribosome**, **cytoplasm**, **lysosome**, **organelle**, **vesicle**, **vacuole**, genetic, DNA, RNA, **GB**, **nucleus**, **cytoskeleton**, **mitochondrion**, **cell membrane**, **chloroplast**, **cell wall** ***SKILLS FOCUS:*** model, analyze, microscopy Formulate explanations by using logic and evidence. **(I&E 1.d)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Cell City Activity** Students create an analogy of cell organelles to city operations. • Glen. LS, Activity, "Comparing Cells", p 46	6 Days (3 Blocks)
… the Central Dogma of molecular biology outlines the flow of information from transcription of ribonucleic acid (RNA) in the nucleus to translation of proteins on ribosomes in the cytoplasm. **(1d)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	***NOTE:*** *The point of this standard is to become familiar with the overall flow of information from DNA codes to structural proteins.* ***Do not*** *get into the details of* ***how*** *this happens (base pairing, transcription and translation processes). These will be addressed later in Standard Sets 4 and 5.* • Describe the DNA in the nucleus as the template code from which proteins are made. • Explain that parts of the DNA contain codes for specific proteins. • Explain that when proteins are needed, their part of the DNA is copied (transcribed) into messenger RNA (mRNA). • Explain that mRNA carries the code to ribosomes out in the cytoplasm, where it is converted (translated) into the protein originally coded by the DNA. • Recall that this process is considered the Central Dogma of molecular biology.	**Glen. LS**, Ch 4:3	***KEY VOCABULARY:*** **DNA**, **RNA**, **template** ***SKILLS FOCUS:*** model, analyze ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • Glen. LS, Visual Learning, p 113 TE	2 Days (1 Block)
… the role of the endoplasmic reticulum and Golgi apparatus in the secretion of proteins. **(1e)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Identify two types of endoplasmic reticulum (ER): smooth and rough. ° Recall that rough ER synthesizes proteins. ° Recall that smooth ER modifies lipids. • Explain that proteins that are to be sent outside the cell are moved to the Golgi apparatus where they are modified, packaged, and moved to the cell membrane to be secreted.	**Glen. LS**, Ch 2:1	***KEY VOCABULARY:*** endoplasmic reticulum, rough ER, smooth ER ***SKILLS FOCUS:*** model, analyze ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Student-Generated Analogies** Have students create detailed analogies for the functions of the rough ER, smooth ER, and Golgi apparatus (i.e., the Golgi apparatus as a post office).	1 Day (_ Block)

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide. **(1f)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Explain that photosynthesis is a complex process that converts visible light energy into chemical energy in carbohydrate molecules. • Recall that the processes of photosynthesis take place within chloroplasts, which can be seen under a microscope in plant cells and photosynthetic protists. • Explain that photosynthesis occurs in two reactions: one light-dependent and the other light-independent. ° Recall the overall reaction showing how carbon dioxide and water are turned into sugar (glucose) and oxygen. ° Explain that the light-dependent reaction within the thylakoid membrane is where light energy is first converted into chemical bond energy. ° Explain that the light-independent reaction uses stored energy to build sugar molecules.	**Glen. LS**, Ch 2:1, 3:3, 11:1	***KEY VOCABULARY:*** **ATP** **NADPH** pigment chlorophyll thylakoids ***SKILLS FOCUS:*** model, analyze, microscopy, inference, computer modeling, measuring Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data. **(I&E 1.a)** Formulate explanations by using logic and evidence. **(I&E 1.d)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Microscope Observations** Have students observe carefully prepared or commercially produced thin section slides. They should note structural organization and explain how it facilitates of the cells to sunlight and carbon dioxide during photosynthesis. CA Sci. Framework, p 223 • Glen. LS, Trapping and Using Energy, p 82 TE • Glen. LS, Mini Lab, "Inferring What Plants Need to Produce Chlorophyll", p 307 • Glen. LS, Quick Demo, Elodea removing CO_2, p 308 TE • CD-ROM, Cell Biology and Genetics • **Photosynthesis Rate Investigations** Have students measure oxygen production rates of aquatic plants, such as elodea, by collecting the oxygen gas in a volumeter. Students should be encouraged to explore the effects of different variables on the rate of O_2 production. *[Note: if students want to vary the intensity of light by varying the distance to a light source, they can place a flat-sided bottle of water between the plant and the light source to dissipate unwanted heat that would affect the results.]* CA Sci. Framework, p 223	6 Days (3 Blocks)

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… the role of the mitochondria in making stored chemical bond energy available to cells by completing the breakdown of glucose to carbon dioxide. **(1g)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Define cellular respiration as a series of reactions that release the chemical energy stored in the bonds of fat, protein, and carbohydrate (mostly glucose) molecules. • Explain that most of the energy produced by respiration is put into the bonds of ATP, a molecule that powers most cell activities.	**Glen. LS**, Ch 2:1, 3:3, and 11:1	***KEY VOCABULARY:*** **cellular respiration** ***SKILLS FOCUS:*** model, interpreting ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Modeling Molecular Interactions** Have groups of students act out the interactions of the carbon fragments and ADP/ATP within the mitochondria, or model with process with visuals.	3 Days (1_ Blocks)
… most macromolecules (polysaccharides, nucleic acids, proteins, lipids) in cells and organisms are synthesized from a small collection of simple precursors. **(1h)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Identify the common, macromolecules that are polymers (like a chain) of monomers (the links). ° Distinguish the monosaccharides within polysaccharides. ° Distinguish the amino acids in a protein. ° Distinguish the fatty acids, glycerol, and other components in lipids. ° Distinguish the nucleotides in nucleic acids. • Point out the carbon "backbone" of each of these macromolecules.	**Glen. LS**, 3:1, 4:3 and 18:1 mono- and polysaccharides (referred to in the text as carbohydrates) p 70, 520 amino acids p 519, 71, 113 fatty acids p 70, 521 nucleotides p 71, 94F TE,110	***KEY VOCABULARY:*** **polymers** **monomers** **amino acids** **nucleotides** **DNA** **RNA** glucose starch **monosaccharide** **polysaccharide** **glycerol** **lipid** **nucleic acids** ***SKILLS FOCUS:*** compare, contrast ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Macro-Molecular Mugshots** Students identify various representations (2-D and 3-D) of macromolecule monomers and polymers, identifying the characteristic components.	2 Days (1 Block)
… *how eukaryotic cells are given shape and internal organization by a cytoskeleton or cell wall or both*. **(1j*)** **DISTRICT ASSESSMENTS:** OES: pending PT: pending	*[Note: Cytoskeleton was first introduced in 7th Grade – standard 1b. This standard gives further detail about how they function.]* * *Describe the cytoskeleton as the more rigid structures within the cytoplasm that give shape and organization eukaryotic cells.* * *Explain that the cytoskeleton is composed of fine protein threads (called microfilaments) and thin protein tubes (called microtubules).* * *Depict the "9+2" arrangement (9 pairs of microtubules around 2 individual microtubules) which make up cilia and flagella.* * *Explain how the rapid assembly and disassembly of microtubules and microfilaments, and their ability to slide past one another enable cells to move (for example, white blood cells and amoeba).* * *Explain how movement of organelles within the cell use this same mechanism.*	**Glen. LS**, Ch 2:1	***KEY VOCABULARY:*** microfilaments microtubules ***SKILLS FOCUS:*** model, microscopy, observe Formulate explanations by using logic and evidence. **(I&E 1.d)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **9+2 Microtubule Arrangement in Eukaryotic Flagella and Cilia** Great electron microscopic cross-section, diagram, and explanation of how movement occurs can be found in Biology, 5th Ed., (AP Bio Text), Campbell/Reece/Mitchell, p 122 • **Observing Microtubules** Observe plant mitosis in onion root tips to see microtubules that make up the spindle apparatus. Prepared slides of white fish blastula show microtubules in animal cells as the spindle apparatus and centrioles. CA Sci. Framework, p 224	3 Days (1_ Blocks)

Genetics (Meiosis and Fertilization)

2. Mutation and sexual reproduction lead to genetic variation in a population.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… meiosis is an early step in sexual reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each type. **(2a)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	⁎ *Recall the steps of mitosis (which were taught in 7th grade).* • Recall that gametes have only one set of chromosomes (haploid), as opposed to other cells that have two sets of chromosomes (diploid). • Explain that producing haploid gametes involves two cell divisions [that only certain cells can undergo! See standard 2b]. ° Diagram meiosis I, highlighting Prophase I in which the paired homologous chromosomes may exchange parts through breakage and reunion (crossing-over). ° Diagram meiosis II, showing the same mechanics as mitosis, except for skipping DNA replication, thereby ending up with the haploid number of chromosomes. ° Show from diagrams how the four cells formed by the two divisions of meiosis have different chromosomal components (segregation). • Recall that all four haploid cells formed by meiosis in a male produce sperm cells. • Recall that only one of the four haploid cells formed by meiosis in a female forms an egg, while the other three remain small, degenerate polar bodies that cannot be fertilized.	**Glen. LS**, Ch 4:2 and 10:1 (p 277)	***KEY VOCABULARY:*** meiosis (prophase, metaphase, anaphase, telophase, cytokinesis) haploid diploid polar bodies ***SKILLS FOCUS:*** model Recognize the usefulness and limitations of models and theories as scientific representations of reality. **(I&E 1.g)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Meiosis Models** Construct models (without merely copying a template) that illustrate the segregation that takes place during mitosis and meiosis. Suggest using colored yarn or pipe cleaners to represent chromosomes. CA Sci. Framework, p 225 • Glen. LS, Make a Model, p 107 TE • **Meiosis Observations** Observe meiosis stages in prepared slides of Ascaris blastocyst cells. CA Sci. Framework, p 225	6 Days (3 Blocks)
… only certain cells in a multicellular organism undergo meiosis. **(2b)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Recall that only specific diploid cells undergo meiosis. ° Recall that diploid spermatogonia cells in the testes of males produce haploid sperm. ° Recall that diploid oogonia cells in the ovaries of females produce haploid eggs.	**Glen. LS,** (no reference)	***KEY VOCABULARY:*** **spermatogonia** **oogonia** ***SKILLS FOCUS:*** recognize context ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Meiosis Locus-Pocus** Determine the location (locus) of meiosis in various multicellular organisms (not just animals) that reproduce sexually.	1 Day (_ Block)

Genetics (Meiosis and Fertilization)

2. Mutation and sexual reproduction lead to genetic variation in a population.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… how random chromosome segregation explains the probability that a particular allele will be in a gamete. **(2c)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Identify the steps in meiosis where random segregation of genetic information occurs leading to four distinct and genetically different gametes. • Explain how mere chance determines which chromosomes are pulled to a given side during karyokinesis (division of the nucleus). • Explain how this process allows predictions about genetic sorting to be made using laws of probability.	**Glen. LS**, Ch 5:1	***KEY VOCABULARY:*** segregation random **karyokinesis** ***SKILLS FOCUS:*** analyze, model Recognize the usefulness and limitations of models and theories as scientific representations of reality. **(I&E 1.g)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Genetic Chart (Part I)** Create a chart marking traits on chromosomes alternately coming from either the mother of father. Then show how random segregation leads to some gametes carrying a given maternal trait, while others will carry the paternal traits. CA Sci. Framework, p 226	2 Days (1_ Blocks)
… new combinations of alleles may be generated in a zygote through the fusion of male and female gametes (fertilization). **(2d)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Explain that the formation of gametes with randomly segregated chromosomes is the first important step in sexual reproduction. • Explain how, in the second step of sexual reproduction, the chance union of two haploid gametes makes a genetically unique, diploid organism. • Diagram how sperm and egg fuse to form a zygote that combines genotypes of the parents to produce a new combination for the progeny.	**Glen. LS**, Ch 5:1	***KEY VOCABULARY:*** zygote gamete fertilization ***SKILLS FOCUS:*** model Recognize the usefulness and limitations of models and theories as scientific representations of reality. **(I&E 1.g)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Genetic Chart (Part II)** Create a chart to illustrate how the events of meiosis and the chance union of gametes lead to new combinations of alleles in a zygote. CA Sci. Framework, p 226 • **Gametogenesis:** http://www.dac.neu.edu/biology/c.ellis/emb02/frame.html • **Meiosis and Mendelian Genetics with Allele-CSULB:** http://www.csulb.edu/~bruss/courses/biol211A/211Alect2.htm • **Genotype vs. Phenotype** http://www.ess.ucla.edu/huge/genotype2.html	3 Days (1_ Blocks)

Genetics (Meiosis and Fertilization)

2. Mutation and sexual reproduction lead to genetic variation in a population.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… why approximately half of an individual's DNA sequence comes from each parent. **(2e)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Describe a chromosome as a single, very long molecule of double-stranded DNA and proteins. • Define genes as segments of DNA that code for polypeptides (proteins). • Explain how, during fertilization, half of the DNA of the progeny comes from the gamete of one parent, and the other half comes from the gamete of the other parent.	**Glen. LS**, Ch 5:1	***KEY VOCABULARY:*** polypeptide DNA ***SKILLS FOCUS:*** model Recognize the usefulness and limitations of models and theories as scientific representations of reality. **(I&E 1.g)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **DNA Presentation:** http://www.dnaftb.org/dnaftb/15/concept/ • **Introduction to DNA Structure** http://www.blc.arizona.edu/Molecular_Graphics/DNA_Structure/DNA_Tutorial.HTML#Components • **DNA Structure and Coding** http://molvis.sdsc.edu/dna/index.htm	2 Days (1 Block)
… the role of chromosomes in determining an individual's sex. **(2f)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Recall that normal human somatic cells contain 46 chromosomes: 44 pairs of homologous chromosomes and 2 sex chromosomes. • Recall that females usually carry two X chromosomes in each somatic cell. • Recall that males possess one X chromosome and one smaller Y chromosome. • Explain that the sex of the progeny depends on the combination of these two sex chromosomes.	**Glen. LS**, Ch 5:2	***KEY VOCABULARY:*** somatic cell sex chromosome homologous chromosomes ***SKILLS FOCUS:*** model Recognize the usefulness and limitations of models and theories as scientific representations of reality. **(I&E 1.g)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Lab: 50/50 Chances** Use the flip of a coin to demonstrate the 50/50 probability of boy vs. girl babies. Use 12 – 18 groups (families) of six tosses (children) each. Compile class results and calculate ratios.	2 Days (1 Block)
… how to predict possible combinations of alleles in a zygote from the genetic makeup of the parents. **(2g)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Explain that when genetic makeups of parents are known, all the possible assortments of alleles in their gametes can be determined for each gene. • Describe, in general terms, how considering all the possible pair-wise combinations of gametes allows prediction of the possible genetic makeups of progeny. ***NOTE:*** *Punnett Squares are introduced in Standard Set 3.*	**Glen. LS**, Ch 5:1	***KEY VOCABULARY:*** allele gamete zygote ***SKILLS FOCUS:*** model, analyze Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem). **(I&E 1.i)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Genetic Variation** Use a selection of dead flies. Viewing with magnification, observe variations in wings and eye colors. Chart the descriptions.	1 Day (_ Block)

Genetics (Mendel's Laws)

3. A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)

… 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). **(3a)**
[CST, LS10]
 	
DISTRICT ASSESSMENTS:
OES: pending
PT: pending
	• Write genotypes and translate genotypes into phenotypes.
	• Use **Punnett Squares** and probability math to describe the possible gametes and predict possible progeny characteristics.
	• Explain how dominant and recessive alleles interact to express phenotypes.
	  ° Use monohybrid crosses to illustrate human disorders characterized by recessive alleles (such as albinism, cystic fibrosis, and Tay-Sachs).
	  ° Contrast the expression of recessive alleles in the conditions mentioned above with disorders produced by the possession of just one dominant allele (such as Huntington Disease, dwarfism, and neurofibromatosis).
	• Explain the expression of incomplete dominance (such as seen in comparisons of curly, straight, and wavy hair or in the expression of flower colors in snapdragon plants).
	• Illustrate how sex-linked characteristics explain why males express conditions that are rare or not found in females (such as color-blindness and hemophilia).
	• Describe how monohybrid crosses can be used to determine parental genotypes and phenotypes.
	• Describe how dihybrid crosses can be used to determine the possible progeny genotypes and phenotypes.
		Glen. LS, Ch 5:2	***KEY VOCABULARY:***
			allele **genotype**
			phenotype **autosomal**
			dominant **recessive**
			sex-linked gamete
			Punnett Squares progeny
			probability segregation
			monohybred cross filial
			incomplete dominance
			
			SKILLS FOCUS:
			model, analyze
			
			Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem). **(I&E 1.i)**
			
			LABS / DEMOS / ACTIVITIES & RESOURCES:
			• **Lab: A Dihybrid Cross**
			Use a 10x10 kernel area of genetic corn on the cob. Count the phenotypes: yellow smooth, yellow wrinkles, purple smooth, purple wrinkled. Compile class results to determine ratio. Use ratios to identify dominant and recessive traits and 9:3:3:1 ratio.
			• **Lab: Distribution of Inherited Traits**
			Using index cards and paper bags, pull labeled "alleles" from "individuals" to make combinations of offspring. Explanation- Label a bag, "male" and a bag, "female". Write "B" on several index cards as the dominant allele for brown eye color, and "b" on several cards as the recessive allele for blue eye color. Pull random cards from bags and tally genotypes.
			• **Baby Face Activity**
			Students analyze their own genetic facial traits and pair up into "couples" to determine possible characteristics of a child.
			• **"Cracking the Code of Life", NOVA video**
			Human Genome Project, cystic fibrosis, and Tay-Sachs disease
				8 Days (4 Blocks)

Genetics (Mendel's Laws)

3. A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… the genetic basis for Mendel's laws of segregation and independent assortment. **(3b)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Explain how Gregor Mendel was able to deduce that each characteristic of an organism is controlled by two genes, one from each parent. • Diagram Mendel's explanation of how a parental trait can appear to vanish for a generation (first filial – F1) and then reappear in the next generation (second filial – F2). • Recall that if the two alleles are different, the dominant one (if one is dominant) will be expressed over the recessive one. • Recall that Mendel's law of segregation results from the fact that alleles are separated (segregated) by meiosis when gametes are formed. • Explain that the law of segregation applies accurately when genes are located on separate chromosomes that segregate at random. • Explain how the law of segregation does not apply for combinations of genes that reside on the same chromosome.	**Glen. LS**, Ch 5:1	***KEY VOCABULARY:*** **allele** gamete segregation independent assortment ***SKILLS FOCUS:*** model, analyze Solve scientific problems by using quadratic equations and simple trigonometric, exponential, and logarithmic functions.. **(I&E 1.e)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Mendel Research** Students locate and study various resources that describe Mendel's logic. CA Sci. Framework, p 228 • **Mendel Model** Students design and build models to illustrate the laws of segregation and independent assortment. CA Sci. Framework, p 228	5 Days (3 Blocks)

Genetics (Molecular Biology)

4. Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… the general pathway by which ribosomes synthesize proteins, using tRNAs to translate genetic information in mRNA. **(4a)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Explain the twofold role of DNA: 1. store and transfer genetic information from one generation to the next. ***(Standard Sets 2 & 3 focus)*** 2. express that genetic information in the synthesis of proteins, thereby controlling the structure and function of all cells. ***(Standard Set 4 focus)*** • Recall that DNA does not leave the cell nucleus to produce proteins. • Explain how the DNA's code is carried to ribosomes in the cytoplasm (transcription) by complimentary strands of mRNA. • Recall that ribosomes translate mRNAs to make protein. • Recall that free-floating amino acids are bonded to specific tRNAs, which transport them to mRNA on the ribosome. • Demonstrate proper nitrogen base pair matching from DNA to RNA and from RNA to RNA. • Explain how the 3-nucleotide codons of mRNA are paired with the 3-nucleotide anticodons of tRNA as the ribosome moves along the mRNA strand. • Explain how the amino acids on the tRNAs are connected into a growing polypeptide in a sequence specified by the DNA code.	**Glen. LS**, Ch 4:3	***KEY VOCABULARY:*** **RNA** **ribosomes** messenger RNA **exons** ribosomal RNA **interons** transcription translation ***SKILLS FOCUS:*** model, analyze Recognize the usefulness and limitations of models and theories as scientific representations of reality. **(I&E 1.g)** Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem). **(I&E 1.i)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Transcription/Translation Activity (I)** Students simulate the process of converting DNA code to a polypeptide chain on paper or by using representative models. CA Sci. Framework, p 229 • Video: DNA: the secret of life shows computer animations of the transcription and translation in real time.	6 Days (3 Blocks)

Genetics (Molecular Biology)

4. Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… how to apply the genetic coding rules to predict the sequence of amino acids from a sequence of codons in RNA. **(4b)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	∗ *Recall that in simple prokaryotes, mRNA is transcribed from the DNA as a single, continuous sequence.* • Explain how, in eukaryotes, the initial RNA transcript is "edited" before leaving the nucleus. ° Recall that the initial RNA transcript contains exons (nucleotide sequences that are used for protein synthesis) and introns (sequences that are not used). ° Recall that before leaving the nucleus, introns are removed and exons are spliced together. ° Recall that the new, "edited" RNA is now properly called mRNA, and is ready to carry the codon sequence for a protein to a ribosome for translation. • Explain that within the mRNA, a start codon will signal the beginning of a sequence of codons to be translated, and a stop codon signals the end of the sequence to be translated into a protein.	**Glen. LS**, Ch 4:3	***KEY VOCABULARY:*** amino acids **exons** **interons** **codons** **start codons** **stop codons** ***SKILLS FOCUS:*** model, analyze Recognize the usefulness and limitations of models and theories as scientific representations of reality. **(I&E 1.g)** Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem). **(I&E 1.i)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Transcription/Translation Activity (II)** Students add the step of removing introns to their previous model of translation. They can also identify start and stop codons to determine the actual amino acid sequences of the protein to be produced using a table of the genetic code. CA Sci. Framework, p 230	2 Days (1_ Blocks)
… how mutations in the DNA sequence of a gene may or may not affect the expression of the gene or the sequence of amino acids in an encoded protein. **(4c)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Define mutations as permanent changes in the sequence of nitrogen bases (the "code" part of the nucleotides) in DNA. • Explain that a mutation is created when nitrogen bases are not paired properly. • Explain that mutations usually do not improve the product coded by the gene. • Demonstrate how the deletion or addition of base pairs cause mutation by changing the 3-nucleotide per codon reading frame used by the ribosome. • Explain that mutations in somatic cells (any cell other than sperm or egg) are not passed on to offspring, but may cause cancer or other undesirable cellular changes. • Explain how mutations in germ cells (those that produce sperm or egg) can alter the proteins produced in every cell of a progeny organism, causing genetic diseases such as Tay-Sachs, sickle cell anemia, and Duchenne muscular dystrophy.	**Glen. LS**, Ch 4:3	***KEY VOCABULARY:*** mutations base pairs protein synthesis amino acid sequence ***SKILLS FOCUS:*** model, analyze Recognize the usefulness and limitations of models and theories as scientific representations of reality. **(I&E 1.g)** Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena. **(I&E 1.i)** Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. **(I&E 1.m)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • Glen. LS, Activity: Use the Internet, "Mutations", p 116-7	3 Days (2 Blocks)

Genetics (Molecular Biology)

4. Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… specialization of cells in multicellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves. **(4d)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Define gene expression as the process in which a gene codes for a product (usually protein) through transcription and translation. • Recall that nearly all cells in an organism contain the same DNA. • Explain that each cell transcribes only the portions of DNA containing the genetic information for proteins required at that specific time by that specific cell. • Explain that some portions of the DNA are not expressed. • Explain that specific types of cells produce proteins unique to that type of cell, meaning they transcribe portions of DNA that are not transcribed in other cell types.	**Glen. LS**, Ch 5:1	***KEY VOCABULARY:*** gene expression ***SKILLS FOCUS:*** model, analyze Recognize the usefulness and limitations of models and theories as scientific representations of reality. **(I&E 1.g)** Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem). **(I&E 1.i)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • *(See web resources listed for standard 3d.)*	2 Days (1_ Blocks)
… proteins can differ from one another in the number and sequence of amino acids. **(4e)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Recall that proteins are chains of amino acids varying from 50 to 3,000 units long. • Explain that the types, sequences, and numbers of amino acids determine the type of protein produced. Note: This is a "big picture" standard. You may wish to include some details of amino acids, peptide bonds, and folding to explain why the proteins end up being different types, but this is optional.	**Glen. LS,** (no reference)	***KEY VOCABULARY:*** sequence ***SKILLS FOCUS:*** compare	_ Day (_ Block)

Genetics (Biotechnology)

5. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… the general structures and functions of DNA, RNA, and protein. **(5a)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Recall that nucleic acids (DNA and RNA) are polymers composed of monomers called nucleotides. ° Identify the three parts of nucleotides: a pentose (5-carbon) sugar, a phosphoric acid group, and a nitrogen base. ° Distinguish the deoxyribose of DNA from the ribose of RNA. ° Recall the four nitrogen bases of DNA (adenine, guanine, cytosine, and thymine) and how they pair. ° Explain how base pairing is the reason DNA acts as a template for its own replication. ° Explain that only a small part of the DNA is expressed in any given cell, meaning that genes are turned on or off as needed by the cell, producing only what is needed when it is needed. ° Recall that the nitrogen bases of RNA are the same as DNA except that thymine is replaced by uracil. ° Recall that DNA is a double stranded molecule, while RNA is a single strand. ° Recognize the different functional forms of RNA: mRNA serving as a template recognized by the codons of tRNA, and rRNA, which along with proteins, comprises ribosomes. • Recall that proteins are polymers composed of monomers called amino acids. (See also standard 1h.) ° Identify the different functions of proteins: enzymes, transport molecules, hormones, structural components of cells, and antibodies that fight infections.	**Glen. LS**, Ch 4:3 and 3:1	***KEY VOCABULARY:*** **exogenous DNA** **nucleotides** RNA base pairing polymers enzymes DNA (nitrogen bases, pentose sugar phosphoric acid group) ***SKILLS FOCUS:*** model, analyze Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem). **(I&E 1.i)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Transcription/Translation Activity (I)** Students simulate the process of converting DNA code to a polypeptide chain on paper or by using representative models.	4 Days (2 Blocks)

Genetics (Biotechnology)

5. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)

… how to apply base-pairing rules to explain precise copying of DNA during semi-conservative replication and transcription of information from DNA into mRNA. **(5b)**
[CST]
 	
DISTRICT ASSESSMENTS:
OES: pending
PT: pending
	• Describe how DNA replication begins with enzymes unzipping, or unwinding, the double helix to separate the two parental strands.
	• Explain how DNA replication usually starts in a small region, forming a "replication bubble" that expands as it unwinds the double strand and spreads in both directions along the chromosome.
	• Explain how, as the parental strands separate, they serve as a template for new daughter strands.
	  ° Describe the process of binding complementary nucleotides to the parental strand following base-pairing rules.
	  ° Explain how DNA replication is semiconservative in that one parental strand is conserved and joined to a newly synthesized complementary strand.
	• Explain how RNA is produced by transcribing a section of DNA containing the nucleotide sequence that codes for a specific protein.
	• Explain that transcription only occurs on the template DNA strand, not the complementary strand.
	• Recall that RNA (mRNA, specifically) leaves the nucleus and goes to ribosomes in the cytoplasm, where protein synthesis takes place.
		Glen. LS, Ch 4:3	***KEY VOCABULARY:***
			DNA replication template
			replication fork
			semiconservative replication
			
			SKILLS FOCUS:
			Recognize the usefulness and limitations of models and theories as scientific representations of reality. **(I&E 1.g)**
			
			Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem). **(I&E 1.i)**
			
			Recognize the cumulative nature of scientific evidence. **(I&E 1.k)**
			
			LABS / DEMOS / ACTIVITIES & RESOURCES:
			• **DNA Replication Modeling**
			Students create a model to the process of DNA replication showing:
			1. leading and lagging strands
			2. semiconservative process
			3. RNA primers that initiate replication of the daughter DNA fragments
			CA Sci. Framework, p. 232-233
				5 Days (3 Blocks)

Genetics (Biotechnology)

5. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… how genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products. **(5c)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Define recombinant DNA as containing DNA from two or more different sources. • Describe how viruses and bacterial plasmids can serve as vectors to introduce recombinant DNA into a host cell. • Describe the process of commercially producing products using recombinant DNA. ° Describe how recombinant cells are grown in large fermentation vessels. ° Explain that the product of the inserted DNA is either extracted from the cells, or from the medium if the product is secreted by the cells. ° Explain that the products are then purified. • Explain that the purpose of recombinant DNA technology is to isolate and exchange DNA between organisms to fulfill a specific human purpose. ° Explain the benefits of using microorganisms to commercially produce human insulin, human growth hormone, blood clotting factors, and many other products this way. ° Cite specific examples of various agricultural applications of recombinant DNA technology, including increased productivity of food crops and animals, increased resistance to pests, herbicides, and viruses, and greater ability to face harsh environmental conditions.	**Glen. LS**, Ch 5:3	***KEY VOCABULARY:*** vectors restriction enzymes vaccine transgenic animal Human Genome Project sticky ends PCRs gene therapy DNA ligation ***SKILLS FOCUS:*** model, address societal issues Recognize the cumulative nature of scientific evidence. **(I&E 1.k)** Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. **(I&E 1.m)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Modeling Recombinant DNA** Students simulate the process of inserting an antibiotic resistance gene into an organism by manipulating DNA (paper strips) using restriction enzymes (scissors) and DNA ligase (tape). Plan the activity so that students will visualize how restriction enzymes often make staggered cuts that create "sticky ends" and how these ends must be matched during ligation. CA Sci. Framework, p. 233	4 Days (2 Blocks)

Ecology

6. Stability in an ecosystem is a balance between competing effects.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats. **(6a)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Define biodiversity as the collective variety of all living organisms in an ecosystem. • Identify factors that impact biodiversity, including climatic changes, fire, flood, and invasion by organisms from another system. • Explain why greater diversity in an ecosystem gives greater stability.	**Glen. LS**, (Ch 24:1) no direct reference	***KEY VOCABULARY:*** **biodiversity** **habitat** **community** **ecosystem** biotic and abiotic factors **population** ***SKILLS FOCUS:*** observe Formulate explanations by using logic and evidence. **(I&E 1.d)** Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena. **(I&E 1.i)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Virtual Ecosystems** Students can observe virtual ecological experiments from Internet sources, or even create their own ecological experiments using modeling programs (such as EcoBeaker). CA Sci. Framework, p 235 • **Ecology Guest Expert** Invite a government, private, or university ecologist to share their work with a group of classes. CA Sci. Framework, p 235 • **Actual Ecosystems** Design and carry out careful observation and monitoring of an ecosystem over time. CA Sci. Framework, p 235	2 Days (1 Block)

Ecology

6. Stability in an ecosystem is a balance between competing effects.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of non-native species, or changes in population size. **(6b)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Explain that changes in ecosystems are often predictable by understanding climate patterns, seasonal reproductive cycles, population cycles, and migrations. • Describe how unexpected disturbances, such as those caused by human intervention or the introduction of a new species, may destabilize the complex balance in an ecosystem. • Explain that it is important to observe changes in an ecosystem over time (longitudinal analysis) to gain useful understanding, make reasonable predictions, and when possible, plan ways to positively influence an ecosystem.	**Glen. LS**, no reference	***KEY VOCABULARY:*** **longitudinal analysis** coevolution **competition** niche symbiosis commensalism mutualism parasitism ***SKILLS FOCUS:*** inference, observe, measure Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data. **(I&E 1.a)** Formulate explanations by using logic and evidence. **(I&E 1.d)** Recognize the usefulness and limitations of models and theories as scientific representations of reality. **(I&E 1.g)** Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem). **(I&E 1.i)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Ecological Simulations** such as created by EcoBeaker at http://ecobeaker.com or PLATO Life Science at www.plato.com	4 Days (2 Block) … if at all
… how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death. **(6c)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Explain that because it is difficult to directly measure the total population of organisms, population fluctuations are estimated by observing relative rates of birth, death, immigration, and emigration in a population. • Explain that comparing death and emigration to birth and immigration, will show if the population will grow or decline over time.	**Bio:P&E**, no reference	***KEY VOCABULARY:*** **immigration** **emigration** ***SKILLS FOCUS:*** microscopy, data collection ***LABS / DEMOS / ACTIVITIES & RESOURCES:***	1 Day (_ Block)

Ecology

6. Stability in an ecosystem is a balance between competing effects.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration. **(6d)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Explain how organisms depend on non-living natural resources. • Explain how, at the molecular level, organisms depend on chemical cycles of water, carbon, nitrogen, phosphorus and other elements. ° Describe and illustrate how water, carbon, and nitrogen enter the biosphere through photosynthesis and nitrogen fixation in producers and are used by consumers for food and protein synthesis. ° Describe and illustrate how respiration, excretion of waste products, and death recycle chemicals back to the non-living environment.	**Glen. LS**, Ch 25:1,2	***KEY VOCABULARY:*** **producers** **consumers** transpiration **respiration** **combustion** **erosion** **assimilation** ammonification nitrification denitrification **biogeochemical cycles** ***SKILLS FOCUS:*** diagram ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • Have students create complete physical cycles with labels using different biomes from the book examples.	4 Days (2 Blocks)
… a vital part of an ecosystem is the stability of its producers and decomposers. **(6e)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Define the role of producers (plants and photosynthetic microorganisms) as primarily responsible for producing organic matter. • Define the role of decomposers (fungi and microorganisms) as primarily responsible for recycling organic matter. • Explain and provide examples of how conditions that threaten the stability of producer and consumer populations jeopardize the availability of energy and matter to the rest of the biological community.	**Glen. LS**, Ch 25:3	***KEY VOCABULARY:*** **producers** **consumers** **decomposers** **trophic level** ***SKILLS FOCUS:*** model ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Producers & Consumers** Have students study the interactions of producers and decomposers in a closed or restricted ecosystem, such as a worm farm, a composting system, a terrarium, or an aquarium. CA Sci. Framework, p 236	2 Days (1 Block)
… at each link in a food web some energy is stored in newly made structures but much is dissipated into the environment as heat. This dissipation may be represented in an energy pyramid. **(6f)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Design and illustrate energy pyramids for specific ecosystems. • Describe how organisms at each level of a food web store about 10 percent of the energy they take in within structures. • Describe how about 90 percent of the energy is used metabolically to survive and is released to the environment as heat. • Explain and illustrate how at each link in a food web, or level in an energy pyramid, only 10 percent of the energy is passed from an organism to its consumer.	**Glen. LS**, Ch 25:3	***KEY VOCABULARY:*** **producers** **consumers** **trophic levels** **food chain** **food web** **decomposers** omnivores herbivores carnivores detrifivores primary secondary tertiary ***SKILLS FOCUS:*** analyze, illustrate ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • Calculations of Energy Loss • **Links to Food Web/Energy Pyramid Websites.** http://www.ftexploring.com/links/foodchains.html	2 Days (1 Block)

Evolution (Population Genetics)

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.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… why natural selection acts on the phenotype rather than the genotype of an organism. **(7a)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Explain and provide examples showing that natural selection works directly on expressed traits (the phenotype). • Explain that natural selection will have the same influence on an organism whether its phenotype is caused by the expression of a homozygous dominant genotype or of the dominant allele in a heterozygous genotype.	**Glen. LS**, Ch 6:1	***KEY VOCABULARY:*** phenotype genotype heterozygous homozygous dominant recessive ***SKILLS FOCUS:*** analyze, provide evidence Select and use appropriate tools and technology to perform tests, collect data, analyze relationships, and display data. **(1&E 1.a)** Formulate explanations by using logic and evidence. **(I&E 1.d)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • Glen. LS, Explore Activity, "Model Camouflage", p 153	2 Days (1 Block)
… why alleles that are lethal in a homozygous individual may be carried in a heterozygote and thus maintained in a gene pool. **(7b)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Distinguish homozygous and heterozygous genotypes. ° Distinguish dominant, codominant, and recessive homozygous allele pairings. • Define recessive lethal alleles, such as the one responsible for Tay-Sachs disease. • Explain how healthy heterozygous individuals contribute the masked recessive gene to the gene pool, allowing the lethal alleles to persist in the population.	**Glen. LS**, Ch 5:2	***KEY VOCABULARY:*** allele homozygous heterozygous recessive dominant codominant incomplete dominance ***SKILLS FOCUS:*** computer modeling Select and use appropriate tools and technology to perform tests, collect data, analyze relationships, and display data. **(1&E 1.a)** Formulate explanations by using logic and evidence. **(I&E 1.d)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • Variety of Punnett Square activities to demonstrate genotypes vs. phenotypes. Ecosystem Observations.	1 Day (_ Block)
… new mutations are constantly being generated in a gene pool. **(7c)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Explain that random changes in chromosomes occur through additions, deletions, substitutions of nucleotides, and rearrangement of chromosomes. • Explain that mutations are an important source of new genetic variation within a gene pool. • Explain that many mutations have little or no effect on the reproduction or survival of the organism, while others may be harmful or beneficial.	**Glen. LS**, Ch 4:3	***KEY VOCABULARY:*** mutation translocation inversion point mutation ***SKILLS FOCUS:*** analyze, research Formulate explanations by using logic and evidence. **(I&E 1.d)** Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. **(I&E 1.m)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Guest Speaker** Genetic Counselor presentation • **Research paper** Students make presentations on Sickle Cell Anemia and Malaria resistance.	1_ Days (1 Block)

Evolution (Population Genetics)

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.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… variation within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions. **(7d)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Describe and give examples of how changing environmental factors will change how natural selection impacts populations. • Explain how mutation and/or genetic recombination cause variation within a species, which in turn makes it more likely that at least some members of the species will survive environmental changes. • Explain why genetic sameness means vulnerability that could lead to extinction.	**Glen. LS**, Ch 6:1	***KEY VOCABULARY:*** genetic drift recombination ***SKILLS FOCUS:*** model, analyze, infer Formulate explanations by using logic and evidence. **(I&E 1.d)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:***	3 Days (1_ Block)

Evolution (Speciation)

8. Evolution is the result of genetic changes that occur in constantly changing environments.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… how natural selection determines the differential survival of groups of organisms. **(8a)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Explain and site examples of how natural selection favors organisms that are best suited to their immediate environment. ° Explain how the selection for adaptive traits is realigned when the environment changes. ° Provide an example of how traits that were once adaptive may become disadvantageous. ° Explain that organisms not well suited to their environment may die before they can reproduce, and therefore do not pass on their traits to the next generation.	**Glen. LS**, Ch 6:1	***KEY VOCABULARY:*** **recombination divergence natural selection speciation isolation** ***SKILLS FOCUS:*** Identify and communicate sources of unavoidable experimental error. **(I&E1.b)** Formulate explanations by using logic and evidence. **(I&E 1.d)** Know that when an observation does not agree with an accepted scientific theory, the observation is sometimes mistaken or fraudulent (e. g., the Piltdown Man fossil or unidentified flying objects) and that the theory is sometimes wrong. **(I&E 1.n)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Natural Selection Activity** Students explore natural selection through activities that simulate predator-prey relationships where organisms struggle to obtain food or escape becoming food. CA Sci. Framework, p 240 • Expand natural selection activities to demonstrate a variety of affecting factors and outcomes.	2 Days (1 Block)

Evolution (Speciation)

8. Evolution is the result of genetic changes that occur in constantly changing environments.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… a great diversity of species increases the chance that at least some organisms survive major changes in the environment. **(8b)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Explain that, just as variation within a species helps members of the species to survive environmental changes (Standard 7d), so a variety of species within an ecosystem leads to greater chance of having some organisms survive changes.	**Glen. LS**, no reference	***KEY VOCABULARY:*** **biodiversity** ***SKILLS FOCUS:*** research Formulate explanations by using logic and evidence. **(I&E 1.d)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Guest Experts** Invite local scientists from CSULB, El Dorado Nature Center, Long Beach Aquarium, County Sanitation Districts, or oil companies to share ecological data they collect and experiments they perform. CA Sci. Framework, p 235 • **Reports on Rainforest Species** Students research species that are closely reliant on each other. Students work as groups and report on the effects when one or more species is disrupted. Focus Question: Would fewer or more relationships better protect the survival of the ecosystem?	1 Day (_ Block)
… the effects of genetic drift on the diversity of organisms in a population. **(8c)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Define genetic drift as a random change in gene frequencies that may occur when a small sample of individuals is randomly separated from a larger population. • Explain that genetic drift of the small population is random and may not be helpful. • Recall mechanisms by which genetic drift may occur. ° Give examples of the *bottleneck effect* (i.e., nonselective population reductions due to disasters). ° Give examples of the *founder effect* (i.e., colonization of a new habitat by a few individuals).	**Glen. LS**, Ch 6:1 (The concept is described on p 159, though it is not called genetic drift in the text.)	***KEY VOCABULARY:*** genetic drift ***SKILLS FOCUS:*** Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena. **(I&E 1.d)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Graphic Representation** Students create a chart of diagram to illustrate the how genetic drift occurs in a population.	1 Day (_ Block)

Evolution (Speciation)

8. Evolution is the result of genetic changes that occur in constantly changing environments.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… reproductive or geographic isolation affects speciation. **(8d)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Explain how reproductive isolation of different populations of the same species may lead to new species. ° Define **prezygotic** (before fertilization) **barriers** to reproduction as those that prevent mating, such as isolation of habitats, differences in breeding season or mating behavior, or an incompatibility of genitalia or gametes. ° Define **postzygotic** (after fertilization) **barriers** to reproduction as the genetic incompatibilities that prevent the development of viable or fertile hybrids. • Explain that speciation can occur in a geographically isolated location *(allopatric speciation)*. ° Explain the allopatric speciation occurs when populations are separated and adapt to different environmental conditions.	**Glen. LS**, Ch 6:1	***KEY VOCABULARY:*** **prezygotic** **postzygotic** ecological niches **allopatric** ***SKILLS FOCUS:*** research, analyze Formulate explanations by using logic and evidence. **(I&E 1.d)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Rift Research** Students report on the Rift Valley in Africa to find evidence of isolation effects. • **Notes/Diagrams on Speciation: Brown University** http://biomed.brown.edu/Courses/BIO48/21.Models.HTML	4 Days (2 Blocks)
… how to analyze fossil evidence with regard to biological diversity, episodic speciation, and mass extinction. **(8e)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Explain that interpretation of the fossil record indicates that major changes have occurred within Earth's biosphere – called macroevolution. ° Contrast macroevolution with microevolution – the small genetic changes within a single population. ° Recall that four major explosions of life that follow mass extinctions are observed in the fossil record corresponding to the Precambrian, Paleozoic, Mesozoic, and Cenozoic eras. • Explain that episodes of speciation are most dramatic after the appearance of novel characteristics, such as feathers and wings, or after mass extinction has cleared the way for new species. • Explain why extinction is inevitable in a changing world. ° Explain why mass extinctions coincide with rapid global environmental changes.	**Glen. LS**, Ch 6:2	***KEY VOCABULARY:*** paleontologist vestigial structures homologous structures ***SKILLS FOCUS:*** model, analyze, infer, measure Formulate explanations by using logic and evidence. **(I&E 1.d)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • Glen. LS, Activity, "Hidden Frogs", p 162	6 Days (3 Block)

Evolution (Speciation)

8. Evolution is the result of genetic changes that occur in constantly changing environments.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… how to use comparative embryology, DNA or protein sequence comparisons, and other independent sources of data to create a branching diagram (cladogram) that shows probable evolutionary relationships. ***(8f*)*** **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• *Define systematics as the study that connects the biological diversity observed to evolutionary history of species (phylogeny).* ° *Explain that classification is based on similarities between species.* ° *Describe some similarities (homologies) in embryonic development (ontogeny) that may be attributed to common ancestry.* ° *Note that the old assertion the "ontology recapitulates phylogeny" (i.e., that embryonic development replays the entire evolutionary history of a species) is no longer considered valid.* ° *Recall examples of homologous structures (such as embryonic structures or forelimbs of cats, whales, and bats) that also provide evidence of a common origin.* ° *Explain how similarities between species can also be evaluated at the molecular level by comparing amino acids in proteins or nucleotide sequences of DNA.*	**Glen. LS**, Ch 6:2 timeline .....p 166 plants .....p 246 animals .....p 338, 160	***KEY VOCABULARY:*** systematics cladistics cladogram phenetics embryology taxonomy ***SKILLS FOCUS:*** infer Formulate explanations by using logic and evidence. **(I&E 1.d)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Cladistic Activity** Have students study examples of cladograms and create new ones to explore the connection between shared characteristics and sequence of evolutionary change. CA Sci. Framework, p 243 • **UC Berkley Introduction to Cladistics** Http://www.ucmp.berkeley.edu/clad/clad1.html • **American Museum of Natural History: Understanding Cladistics** Http://www.amnh.org/exhibitions/Fossil_Halls/cladistics.html • **Origins of Systematics: Carl Linnaeus** Http://www.ucmp.berkeley.edu/history/linnaeus.html	4 Days (2 Blocks)

Physiology (Homeostasis)

9. As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… how the complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide. **(9a)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Define homeostasis as a complex and dynamic equilibrium by which the body responds to changing demands while maintaining a constant internal environment. • Describe the purpose of the digestive system as removing nutrients from food and delivering them to the circulatory system. • Describe how the lungs and circulatory system work together. ° Explain how the alveoli of the lungs move O_2 from air to the circulatory system. ° Explain that, among other functions, the circulatory system delivers glucose and O_2 molecules by capillaries to each cell of the body where cellular respiration occurs. ° Describe the process of cellular respiration as oxidizing the 6-carbon glucose molecules into CO_2 and H_2O molecules (the same reaction as combustion, only slower), and storing the released energy in a chemical bond within ATP molecules. (See also standard 1g.) ° Explain how the gas exchange process that brought O_2 to the cells works in reverse to carry the CO_2 out of the cells to be released into the alveoli of the lungs and exhaled. • Explain how when amino acids from a protein are used for energy, they are chemically converted (deaminated) by the liver producing toxic ammonia, which is converted to urea and excreted by the kidneys. ° Explain that all these chemicals are transported by the circulatory system. ° Explain that various organs detect and remove specific chemicals from the circulatory system.	**Glen. LS**, Ch 21:1 .....18:2 .....19:1, 20:1 .....20:2	***KEY VOCABULARY:*** homeostasis alveoli ATP deaminated glucose glycogen ***SKILLS FOCUS:*** observe, compare, classify Formulate explanations by using logic and evidence. **(I&E 1.d)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • Glen. LS, Mini Lab, "Modeling Kidney Function", p 585 • Glen. LS, Activity, "Kidney Structure", p 589	6 Days (3 Blocks)

Physiology (Homeostasis)

9. As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… how the nervous system mediates communication between different parts of the body and the body's interactions with the environment. **(9b)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Explain how an individual becomes aware of the environment through sense organs and other body receptors (through touch, taste, and smell and by collecting information about temperature, light, and sound). • Examine and describe various ways the body constantly responds to external stimuli through reflex arcs (e.g., pupils adjusting to light, blood circulation responding to temperature). • Explain how hormones work in conjunction with the nervous system. ° Describe how insulin released by the pancreas into the blood regulates the uptake of glucose by muscle cells as controlled by the nervous system. ° Explain how the hypothalamus of the brain controls the pituitary master gland to produce human growth hormone, and many other specialized hormones as needed by the body.	**Glen. LS**, Ch 21:2 and 22:1,2	***KEY VOCABULARY:*** reflex arc hypothalamus pituitary gland ***SKILLS FOCUS:*** classify, describe Formulate explanations by using logic and evidence. **(I&E 1.d)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Peripheral Nervous System** http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/P/PNS.html • **BBC Reflex Arc** http://www.bbc.co.uk/schools/gcsebitesize/biology/humans/nervoussystemrev4.shtml • **The Basics of How Insulin and Glucagon Work** http://www.endocrineweb.com/insulin.html • **Hormone Regulation** http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/H/Hormones.html • **Hypothalamus and the ANS** http://thalamus.wustl.edu/course/hypoANS.html	3 Days (2 Blocks)
… how feedback loops in the nervous and endocrine systems regulate conditions in the body. **(9c)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Define feedback loops as the means by which the nervous system uses the endocrine system to regulate body conditions. • Explain how the presence or absence of hormones in blood brought to the brain by the circulatory system will trigger an attempt by the brain to adjust endocrine activity and regulate the conditions in the body. ° Explain how the hormone leptin functions through a feedback loop. 1. Describe how leptin is released by fat cells when they become filled with storage reserves. 2. Describe how blood carries the leptin to the brain where it acts to inhibit appetite (an example of negative feedback). 3. Explain that when fat reserves decrease, the fat cells produce less leptin and the appetite center of the brain starts the hunger stimulus to activate the urge to eat.	**Glen. LS**, Ch 22:1	***KEY VOCABULARY:*** endocrine system leptin ***SKILLS FOCUS:*** research ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Feedback Feedback** Research another hormone feedback loop (other than leptin) and create a poster or graphic organizer to present the findings.	3 Days (1_ Block)

Physiology (Homeostasis)

9. As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… the functions of the nervous system and the role of neurons in transmitting electrochemical impulses. **(9d)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Define a nerve impulse (or action potential) as a reversal of the normal electrical potential in a neuron. • Explain how a nerve impulse, or action potential, is generated when sodium ions (Na^+) to rush into the neuron, and that this impulse runs very quickly along the neuron as a chain reaction. • Explain how the sodium is pushed back out by the sodium-potassium pumps, which actively transport the ions against the concentration gradient by using energy from ATP. • Explain how the action potential causes the release of neurotransmitter chemicals from the end of the axon, which enter the small gap (synapse) between neurons and begins an action potential in the next neuron.	**Glen. LS**, Ch 21:1	***KEY VOCABULARY:*** electrochemical axon hydrolysis synapse neurons neurotransmitter ***SKILLS FOCUS:*** sequence, describe, hypothesize, diagram ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • Glen. LS, Quick Demo, p 601 TE • Glen. LS, Activity, p 603 TE • **Impulse Shopping** Have students create a sequential storyboard illustrating the steps of electrochemical impulse transmission.	2 Days (1 Blocks)
… the roles of sensory neurons, interneurons, and motor neurons in sensation, thought, and response. **(9e)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Diagram a neuron showing the direction of impulses from dendrite to cell body to axon. • Explain and diagram how impulses travel from sensory neurons to interneurons to motor neurons in a reflex action. • Explain how similar pathways lead to the brain where sensations become consciously experienced and conscious actions can be taken.	**Glen. LS**, Ch 21:1	***KEY VOCABULARY:*** dendrite motor neurons interneurons ***SKILLS FOCUS:*** diagram, describe, sequence, identify ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • Diagram the path from dendrite to reflex action.	1 Day (_ Block)

… the individual functions and sites of secretion of digestive enzymes (amylases, proteases, nucleases, lipases), stomach acid, and bile salts. ***(9f*)***
DISTRICT ASSESSMENTS:
OES: pending
PT: pending
	• *Explain that digestion requires secretions of enzymes to be mixed with food as it passes through the body.*
	  ◦ *Describe how salivary glands and the pancreas secrete amylase, an enzyme that breaks starch down into sugar.*
	  ◦ *Describe how stomach acid and gastric enzymes begin the breakdown of proteins in food.*
	  ◦ *Explain that intestinal and pancreatic secretions continue to break down proteins as they pass beyond the stomach.*
		Glen. LS, Ch 18:2	***KEY VOCABULARY:***
			enzymes proteases
			amylase
			SKILLS FOCUS:
			classify, diagram, relate, generalize
			LABS / DEMOS / ACTIVITIES & RESOURCES:
			• **Digestive Tract Diagram**
			Diagram the digestive tract, labeling important points of secretion and tracing the pathways from digestion of starches, proteins, and other foods.
			CA Sci. Framework, p 246
			• Glen. LS, Quick Demo, "Enzymes", p 530 TE
				2 Days (1 Block)

Physiology (Homeostasis)

9. As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… the homeostatic role of the kidneys in the removal of nitrogenous wastes and the role of the liver in blood detoxification and glucose balance. ***(9g*)*** **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• *Outline the role of the kidney nephron in the formation of urine.* ° *Explain how the microscopic nephrons within the kidney filter out body wastes and regulate water.* • *Explain the role of the liver in blood detoxification.* ° *Explain how the liver removes toxins from the blood, storing them, and excreting them into the bile.*	**Glen. LS**, Ch 18:2 and 20:2 diagram and explanation on p 535 brief mention on p 534 about how bile breaks up fats, but does not mention removing toxins	***KEY VOCABULARY:*** nitrogenous waste detoxification ***SKILLS FOCUS:*** classify, describe, compare ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • Glen. LS, Mini Lab, "Modeling Kidney Function", p 585	2 Days (1 Block)

Physiology (Infection and Immunity)

10. Organisms have a variety of mechanisms to combat disease.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… the role of the skin in providing nonspecific defenses against infection. **(10a)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Explain that the skin serves as a physical barrier to the enormous number of potentially disease causing microorganisms in the environment. • Explain the potential dangers of cuts and abrasions that compromise the skin's ability to serve as a barrier.	**Glen. LS**, Ch 23:1	***KEY VOCABULARY:*** inflammatory response temperature response histamine mucous ***SKILLS FOCUS:*** describe, analyze ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • Glen. LS, Activity, "Lines of Defense" (pH of sweat), p 659 • **Merck Manual on the Epidermis** http://www.merck.com/mmhe/sec18/ch201/ch201b.html • **Commercial Site with Short Movie and Information on Skin** http://www.convatec.com/US_en/consumer/skin/education/about_skin_care/structure_function.jhtml	1 Day (_ Block)
… the role of antibodies in the body's response to infection. **(10b)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Define antigens as substances that are foreign to the body. • Give specific examples of antigens, such as the surface proteins of a flu virus, which are different in shape and structure from human proteins. • Explain that when the immune system recognizes antigens, it produces proteins called antibodies that specifically bind to the antigen that was found. • Explain that antibodies either inactivate pathogens directly or signal other immune cells to attack the pathogen.	**Glen. LS**, Ch 23:1	***KEY VOCABULARY:*** antigen pathogen antibody ***SKILLS FOCUS:*** analyze, research ***LABS / DEMOS / ACTIVITIES & RESOURCES:***	2 Days (1 Block)

Physiology (Infection and Immunity)

10. Organisms have a variety of mechanisms to combat disease.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… how vaccination protects an individual from infectious diseases. **(10c)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Explain that a problem with the immune system is that it takes several weeks to develop immunity to a new antigen. • Explain that vaccinations avoid the problem of delay by giving the body contact with the disease antigens in advance. • Recall that vaccines for a given disease usually contain killed pathogens for that disease or a purified surface protein from the pathogen. • Explain how the antigens in vaccines do not cause disease, but stimulate the body to generate antibodies to oppose the pathogen. • Explain that the immune system of a body that has been exposed to a vaccine responds quickly, because it "remembers" having been exposed to the antigen.	**Glen. LS**, Ch 23:1	***KEY VOCABULARY:*** immunity vaccination vaccine ***SKILLS FOCUS:*** research Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. **(I&E 1.m)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • Glen. LS, Mini Lab, "Determining Reproduction Rates", p 661 • **Personal Vaccination Record** Students find their own vaccination records and research the purpose and makeup of one of the vaccinations. CA Sci. Framework, p 248 • **History of Vaccines** Students research the history of vaccine development from the 1700s through the twentieth century and up to the most current applications. CA Sci. Framework, p 248	3 Days (1_ Block)

Physiology (Infection and Immunity)

10. Organisms have a variety of mechanisms to combat disease.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… 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. **(10d)** [CST, LS10] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Define viruses as the simplest form of a genetic entity, containing genetic material (either DNA or RNA) surrounded by protein, but have no ribosomes or other organelles. • Define bacteria as the simplest organisms with a full cellular structure. • Compare and contrast the growth and reproduction requirements of viruses and bacteria. ° Explain that viruses are incapable of metabolism or reproduction outside of the cells of other living organisms. ° *Explain that bacteria are self-contained organisms that live in a variety of environments and can reproduce sexually or asexually. (LBUSD)* ° Explain that viruses can be benign or cause harm by destroying or altering host cell structures from within. ° Explain how bacteria can be benign *or helpful (LBUSD)*, or can cause harm by damaging host cells or releasing toxins. • Compare the body's defense mechanisms against viral and bacterial infections. ° Explain that the body recognizes the surface proteins of viruses as antigens and produces antibodies to neutralize the viruses. ° Explain that the body recognizes the surface proteins and toxins of bacteria as antigens and produces antibodies to neutralize them. • Explain the differences in effective treatments for viral and bacterial infections. ° Define antiseptics as chemicals that kill infectious agents. ° Explain how antiseptics can be used to prevent infections or even treat surface infections. ° Define antibiotics as substances that can treat bacterial infections by destroying or interfering with the growth or physiology of the bacterial cell wall, or by inhibiting the synthesis of bacterial DNA, RNA, or proteins. ° Explain that antibiotics do not work against viruses. ° Explain the dangers of developing antibiotic-resistant bacteria through long-standing over-application of antibiotics.	**Glen. LS**, Ch 23:2 and 2:3	***KEY VOCABULARY:*** capsid envelope bacteriophage antibiotic resistance antibiotic antiseptic toxin ***SKILLS FOCUS:*** compare and contrast Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. **(I&E 1.m)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Research on Infections** Students research infections caused by protists (malaria, amoebic dysentery), bacteria (blood poisoning, botulism, food poisoning, tuberculosis), and viruses (rabies, colds, influenza, AIDS), or specific infections currently being discussed in the media. Students should address growth and reproduction requirements, and the effectiveness of the bodies defenses and medical treatments. CA Sci. Framework, p 249 • **Antibiotic Disc Activity** Students can use commercially available antibiotic discs to show the inhibition of bacterial growth on agar plates. CA Sci. Framework, p 249	5 Days (2_ Blocks)

Physiology (Infection and Immunity)

10. Organisms have a variety of mechanisms to combat disease.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… why an individual with a compromised immune system (for example, a person with AIDS) may be unable to fight off and survive infections of microorganisms that are usually benign. **(10e)** [CST] **DISTRICT ASSESSMENTS:** OES: pending PT: pending	• Explain that the human immunodeficiency virus (HIV) infects and destroys key cells of the immune system before those cells can recognize and attack the virus. • Explain how an immune system can be compromised so that it becomes either unable to recognize a dangerous antigen or incapable of mounting an appropriate defense.	**Glen. LS**, Ch 23:2	***KEY VOCABULARY:*** AIDS HIV compromised opportunistic infection ***SKILLS FOCUS:*** analyze Formulate explanations by using logic and evidence. **(I&E 1.d)** ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • Discovery Video, "Unterstanding Viruses", available at SMRC • **Simplified Graphics of Immune System and HIV Effect** http://www.saskschools.ca /~bert_fox/2000gr/morrell_files /frame.htm	1 Day (_ Block)

Diversity (LBUSD)

Organisms can be placed into taxonomic groups based upon morphological and biochemical similarities.

Standards and Assessments "Students know…"	Task Analysis "Students are able to …"	Adopted Textbook Correlation(s)	Connections	Appx Time (per 180 days)
… organization of living organisms reflects our understanding of evolutionary development.	* *Demonstrate the use of a taxonomic key.* * *Explain why scientists use scientific names instead of common names.* * *List the seven levels of classification.* * *Describe and apply the scientific system of naming organisms.* * *Define the term, "species".* * *List the kingdoms of organisms, recognizing that these are dynamic, depending on available evidence.* * *Identify the distinguishing characteristics of members of each of the kingdoms.* * *Describe how the classification of living things reflects evolutionary theory.* * *Explain general body organization plans in vertebrates and invertebrates.*	**Glen. LS**, Ch 1:4 Ch's 7-9, and 12-15	***KEY VOCABULARY:*** kingdom family phylum genus class species order taxonomy vertebrate invertebrate ***SKILLS FOCUS:*** describe, analyze ***LABS / DEMOS / ACTIVITIES & RESOURCES:*** • **Dissections** Students compare structures and functions in different organisms. They should also describe the organizational differences between different organism classifications. • **UC Berkeley Museum of Paleontology** http://www.ucmp.berkeley.edu/ help/taxaform.html • **Discovery Lab for Taxonomy** http://jrscience.wcp.muohio.edu/ lab/TaxonomyLab.html • **Montgomery College Library** http://mclibrary.nhmccd.edu/ taxonomy.html	10 Days (5 Blocks)

LABORATORY RECOMMENDATIONS:

Core experiences for this course should include detailed laboratories with complete write-ups (when appropriate) on the following topics:

1) Wet-mount Slide Preparation
2) Dialysis Tubing - Osmosis
3) Elodea Leaf - Plasmolysis
4) Enzyme Lab
5) Mitosis / Meiosis
6) Photosynthesis / Chromatography
7) Cell Respiration
8) DNA Isolation
9) Genetic Probability
10) Protein Synthesis
11) Natural Selection Activity
12) Comparative Anatomy Dissections

A minimum of 20 laboratories is recommended for this course. Our district recommends that approximately 40% of instructional time be devoted to hands-on laboratory and project-based activities.

MATERIALS:

Basic Textbook and Supplementary Materials: Life Science, Biggs / Daniel / Ortleb / Rillero / Zike, Glencoe McGraw-Hill, © 2002

Safety Equipment:	fire extinguisher, eye wash station
Measuring Devices:	centigram balances, mm rulers, triple beam balances, volumetric graduated cylinders
Other Laboratory Equipment:	microscopes, dissection equipment, Bunsen burners, petri dishes, pipettes, electrophoresis equipment, standard materials and equipment comparable to a professional or college laboratory
Laboratory Supplies:	chemical reagents, filter paper, chromatography paper
Other:	Computer-based software and hardware, including computer labs, internet access, word processing and presentation programs, and student tutorials/practice.

- Many items are shared in your science department or may be available through Science/Math Resource Center (SMRC).

METHODS:

Learning styles of students may be addressed by implementing combinations of the following:

Significant, Proven Science Strategies for ALL Science Students

- ❑ Hands-On Lab's
- ❑ Inquiry Activities
- ❑ Short/Long-term projects
- ❑ Student Presentations
- ❑ Peer Teaching
- ❑ Summarization
- ❑ Essential Questions
- ❑ Thematic Units
- ❑ Field Experiences
- ❑ Current Events
- ❑ Career Choices
- ❑ Guest Speakers

Reading Strategies in Science

- ❑ Learning Logs
- ❑ Pre-teaching
- ❑ Vocabulary
- ❑ Pre-reading
- ❑ Text Structures
- ❑ Trail Markers
- ❑ Reciprocal Teaching
- ❑ Functional Text

SDAIE Strategies for English Learners

- ❑ Tapping/Building Prior Knowledge (Graphic Organizers, Schema)
- ❑ Grouping Strategies
- ❑ Multiple Intelligences
- ❑ Adapt the Text
- ❑ Interactive Learning (Manipulatives, Visuals)
- ❑ Acquisition Levels
- ❑ Language Sensitivity
- ❑ Lower the Affective Filter (including Processing Time)
- ❑ Home/School Connection (including Cultural Aspects)

Differentiation for Advanced Learners

- ❑ Curriculum Compacting
- ❑ Tiered Assignments
- ❑ Flexible Grouping
- ❑ Acceleration
- ❑ Depth and Complexity
- ❑ Independent Study

Please note that these strategies often overlap and should not be limited to specifically defined courses or student populations.