

Orange Unified School District
LIFE SCIENCE
Year Course

GRADE LEVEL: 9-12

PREREQUISITES: None

INTRODUCTION TO THE SUBJECT:

Life Science is designed to help students understand their world from a biological science point of view. Students will develop an understanding of the anatomy and physiology of the human body to aid wise health care decisions. A study of ecology and pollution will make students aware of their place in the biosphere and the importance of preserving it. The course capitalizes on the student's personal experiences of everyday life, science in the home, and science in the news. Textbooks are not the sole source of the curriculum; everyday materials and laboratory equipment, videotapes, computer software, and other printed materials such as reference books provide a substantial part of the student experience.

ADOPTED TEXT: Biggs, Alton, et. al. *Life Science*. Glencoe/McGraw-Hill, 2002.

FIRST SEMESTER

ASSESSMENT BLUEPRINT:

Semester	Standard	No. Items
1	CB 1a Nucleus is repository for genetic information	1
	CB 1b Mitochondria and chloroplasts	2
	CB 1c Mitosis	3
	CB 2a Molecules consist largely of six elements	1
	CB 2b Living organisms have many different kinds of molecules	2
	CB 3a Cells enclosed	1
	CB 3b Prokaryotic cells, eukaryotic cells, viruses differ	3
	CB 3c Energy captured by chloroplasts/stored through synthesis of sugar & CO ₂	2
	G 1a Differences of life cycles/reproduction of sexual/asexual organisms	1
	G 1b Inherited traits determined by one or more genes	1
	G 1c Genes, alleles, dominant/recessive, phenotype	2
	G 1d DNA	1
	G 2a Meiosis	1
	G 2b Fusion of male/female gametes (fertilization)	2
	G 2c Half of DNA sequences comes from each parent	2
	G 2d Role of chromosomes in determining individual's sex	1
	G 3a Prediction of probable outcome of phenotypes	2
	G 4a Structure and function of DNA, RNA, protein	3
	Ev 1a Genetic variation/environmental factors are causes	2
	Ev 1b Reasoning of Charles Darwin regarding natural selection	1
	Ev 1c Evidence from geology, fossils, anatomy as bases for theory of evolution	1
	Ev 2a Natural selection as phenotype rather than genotype	1
	Ev 2b Alleles in homozygous and heterozygous	2
	Ev 2c New mutations	1
	Ev 2d Variations increase likelihood of survival in changed environment	1
	Ev 3a Natural selection determines differential survival of organisms	2
	Ev 3b Diversity of species increases chance of survival in environmental change	2
	Ev 3c Fossil evidence: biological diversity, episodic speciation, mass extinction	1
	Ph 1a Levels of organization for structure and function of plants and animals	1
	I&Ea (9-12) Appropriate tools	2
	I&Ec Connection among hypotheses, data, conclusions, theory	2

COURSE OVERVIEW AND APPROXIMATE UNIT TIME ALLOTMENTS:

NOTE: The Investigation and Experimentation standards are embedded throughout the course.

I. Exploring and Classifying Life 3

Essential Learning: Students will apply the scientific method to problem solving and laboratory exercises.

	Topic	Text	Standards
A.	What is Science?	Chapter 1	
B.	Living Things		I&E 1a
C.	Where does life come from?		I&E 1b, 1c, 1d, 1f, 1g, 1j, 1k, 1l, 1m
D.	How are living things classified?		Ph 1a

II. Cells 2

Essential Learning: Students will know the structure and function of cells and how they differ in complexity.

	Topic	Text	Standards
A.	Cell Structure	Chapter 2	CB 3a, 3b
B.	Viewing Cells		I&E 1c, 1d
C.	Viruses		CB 3b Ph 4b, 4c

III. Cell Processes 2

Essential Learning: Students will know the structure and function of cells and how they differ in complexity.

	Topic	Text	Standards
A.	Chemistry of Life	Chapter 3	CB 2a, 2b
B.	Moving Cellular Materials		CB 3a
C.	Energy for Life		CB 1a, 1b, 3c

IV. Cell Reproduction 3

Essential Learning: Students will the difference between mitosis and meiosis and basic cell reproduction.

	Topic	Text	Standards
A.	Cell Division and Mitosis	Chapter 4	CB 1c, G 1a, 1c, 1d
B.	Sexual Reproduction and Meiosis		G 2a, 2b, 2c, 2d
C.	DNA		G 4a

V. Heredity 3

Essential Learning: Students will know the difference between mitosis and meiosis and basic cell reproduction.

	Topic	Text	Standards
A.	Genetics	Chapter 5	G 1b, 1c, 3a Ev 2b, 2c
B.	Genetics Since Mendel		G 3a
C.	Advances in Genetics		

VI. Adaptations over time 3
Essential Learning: Students will know the foundation of evolution and the variations and adaptations of species.

	Topic	Text	Standards
A.	Ideas About Evolution	Chapter 6	Ev 1a, 1b, 1c
B.	Clues About Evolution		Ev 2a, 2b, 2c, 2d
C.	The Evolution of Primates		Ev 3a, 3b, 3c

VII. Review and Assess 2

SECOND SEMESTER

ASSESSMENT BLUEPRINT:

Semester	Standard	No. Items
2	Ec 1a Food web	1
	Ec 1b Organisms categorized by functions in ecosystem	2
	Ec 1c Support of organisms depends on resources and abiotic factors	3
	Ec 2a Biodiversity affected by alterations of habitats	2
	Ec 2b Changes in ecosystem resulting from climate, human activity, etc.	2
	Ec 2c Causes of fluctuation in population size	1
	Ec 2d Water, carbon, nitrogen, oxygen cycles	2
	Ec 2e Stability of producers and decomposers	1
	Ec 2f Food web; energy pyramid	1
	Ph 1b Bones and muscles provide structural framework for movement	2
	Ph 2a Contractions of heart, blood pressure, heart valves	2
	Ph 3a Body systems provide oxygen, nutrients, remove waste	4
	Ph 3b Nervous system	2
	Ph 4a Antibodies	1
	Ph 4b Vaccination	2
	Ph 4c Difference between bacteria and viruses	2

I. Structure and Movement 2
Essential Learning: Students will know how the skeletal and muscular systems coordinate to allow movement.

	Topic	Text	Standards
A.	Skeletal System	Chapter 17	Ph 1b, 3b
B.	Muscular System		
C.	Skin		

II. Circulation and Respiration 2
Essential Learning: Students will know the functions of the circulatory and respiratory systems.

	Topic	Text	Standards
A.	Circulatory System	Chapter 19	Ph 2a, 3a, 4a
B.	Blood		
C.	Lymphatic System		
D.	Respiratory System	Chapter 20	

III. Control and Coordination 1

Essential Learning: Students will know the functions of the circulatory and respiratory systems.

	Topic	Text	Standards
A.	Nervous System	Chapter 21	Ph 2a, 3a, 4a
B.	Senses		

IV. Immunity and Disease 2

Essential Learning: Students will know the functions of the immune system.

	Topic	Text	Standards
A.	Immune System	Chapter 23	Ph 4b, 4c
B.	Infectious Diseases		
C.	Noninfectious Diseases		

V. Interactions of Life and Cycles in Nature 3

Essential Learning: Students will know the relationship between life and various ecosystems.

	Topic	Text	Standards
A.	Living Earth	Chapter 24	Ec 1a, 1b, 1c, 2f
B.	Populations		
C.	Interactions Within Communities		
D.	Cycles in Nature	Chapter 25	Ec 2d, 2e

VI. CST Preparation 1

VII. Ecosystems 3

Essential Learning: Students will know the uniqueness of individual ecosystems.

	Topic	Text	Standards
A.	How Ecosystems Change	Chapter 26	Ec 1c, 2b, 2c
B.	Biomes		
C.	Aquatic Ecosystems		

VIII. Additional Topics at Teacher Discretion 3

DATE OF CURRENT CONTENT REVISION: March 2011

CALIFORNIA CONTENT STANDARDS		# of Items
CB	CELL BIOLOGY	10 items
1	All living organisms are composed of cells, from just one to many trillions, whose details usually are visible only through a microscope. As a basis for understanding this concept:	
<i>a</i>	<i>Students know</i> the nucleus is the repository for genetic information in plant and animal cells.	1
<i>b</i>	<i>Students know</i> that mitochondria liberate energy for the work that cells do and that chloroplasts capture sunlight energy for photosynthesis.	2
<i>c</i>	<i>Students know</i> cells divide to increase their numbers through a process of mitosis, which results in two daughter cells with identical sets of chromosomes.	1
2	Principles of chemistry underlie the functioning of biological systems. As a basis for understanding this concept:	
<i>a</i>	<i>Students know</i> that living organisms are made of molecules consisting largely of carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur.	1
<i>b</i>	<i>Students know</i> that living organisms have many different kinds of molecules, including small ones, such as water and salt, and very large ones, such as carbohydrates, fats, proteins, and DNA.	1
3	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:	
<i>a</i>	<i>Students know</i> cells are enclosed within semi-permeable membranes that regulate their interaction with their surroundings.	1
<i>b</i>	<i>Students know</i> how prokaryotic cells, eukaryotic cells (including those from plants and animals), and viruses differ in complexity and general structure.	2
<i>c</i>	<i>Students know</i> usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide.	1
G	GENETICS	12 items
1	A typical cell of any organism contains genetic instructions that specify its traits. Those traits may be modified by environmental influences. As a basis for understanding this concept:	
<i>a</i>	<i>Students know</i> the differences between the life cycles and reproduction methods of sexual and asexual organisms.	1
<i>b</i>	<i>Students know</i> an inherited trait can be determined by one or more genes.	1
<i>c</i>	<i>Students know</i> plant and animal cells contain many thousands of different genes and typically have two copies of every gene. The two copies (or alleles) of the gene may or may not be identical, and one may be dominant in determining the phenotype while the other is recessive.	1
<i>d</i>	<i>Students know</i> DNA (deoxyribonucleic acid) is the genetic material of living organisms and is located in the chromosomes of each cell.	1
2	Mutation and sexual reproduction lead to genetic variation in a population. As a basis for understanding this concept:	
<i>a</i>	<i>Students know</i> only certain cells in a multi-cellular organism undergo meiosis.	1
<i>b</i>	<i>Students know</i> new combinations of alleles may be generated in a zygote through the fusion of male and female gametes (fertilization).	1
<i>c</i>	<i>Students know</i> why approximately half of an individual's DNA sequence comes from each parent.	1
<i>d</i>	<i>Students know</i> the role of chromosomes in determining an individual's sex.	1

CALIFORNIA CONTENT STANDARDS		# of Items
G	GENETICS (continued)	12 items
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:	
<i>a</i>	<i>Students know</i> how to predict the probable outcome of phenotypes in a genetic cross from the genotypes of the parents and mode of inheritance (autosomal or X-linked, dominant or recessive).	2
4	The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:	
<i>a</i>	<i>Students know</i> the general structures and functions of DNA, RNA, and protein.	2
Ec	ECOLOGY	11 items
1	Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. As a basis for understanding this concept:	
<i>a</i>	<i>Students know</i> matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.	1
<i>b</i>	<i>Students know</i> populations of organisms can be categorized by the functions they serve in an ecosystem.	1
<i>c</i>	<i>Students know</i> the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.	2
2	Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept:	
<i>a</i>	<i>Students know</i> biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.	1
<i>b</i>	<i>Students know</i> how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.	1
<i>c</i>	<i>Students know</i> how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.	1
<i>d</i>	<i>Students know</i> how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration.	2
<i>e</i>	<i>Students know</i> a vital part of an ecosystem is the stability of its producers and decomposers.	1
<i>f</i>	<i>Students know</i> at each link in a food web some energy is stored in newly made structures but much energy is dissipated into the environment as heat. This dissipation may be represented in an energy pyramid.	1

	CALIFORNIA CONTENT STANDARDS	# of Items
Ev	EVOLUTION	11 items
1	Biological evolution accounts for the diversity of species developed through gradual processes over many generations. As a basis for understanding this concept:	
<i>a</i>	<i>Students know</i> both genetic variation and environmental factors are causes of evolution and diversity of organisms.	1
<i>b</i>	<i>Students know</i> the reasoning used by Charles Darwin in reaching his conclusion that natural selection is the mechanism of evolution.	1
<i>c</i>	<i>Students know</i> how independent lines of evidence from geology, fossils, and comparative anatomy provide the bases for the theory of evolution.	1
2	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:	
<i>a</i>	<i>Students know</i> why natural selection acts on the phenotype rather than the genotype of an organism.	1
<i>b</i>	<i>Students know</i> why alleles that are lethal in a homozygous individual may be carried in a heterozygote and thus maintained in a gene pool.	1
<i>c</i>	<i>Students know</i> new mutations are constantly being generated in a gene pool.	1
<i>d</i>	<i>Students know</i> variation within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions.	1
3	Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:	
<i>a</i>	<i>Students know</i> how natural selection determines the differential survival of groups of organisms.	1
<i>b</i>	<i>Students know</i> a great diversity of species increases the chance that at least some organisms survive major changes in the environment.	1
<i>c</i>	<i>Students know</i> how to analyze fossil evidence with regard to biological diversity, episodic speciation, and mass extinction.	2
Ph	PHYSIOLOGY	10 items
1	The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function. As a basis for understanding this concept:	
<i>a</i>	<i>Students know</i> plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems, and the whole organism.	1
<i>b</i>	<i>Students know</i> how bones and muscles work together to provide a structural framework for movement.	1
2	Physical principles underlie biological structures and functions. As a basis for understanding this concept:	
<i>a</i>	<i>Students know</i> that contractions of the heart generate blood pressure and that heart valves prevent backflow of blood in the circulatory system.	1

CALIFORNIA CONTENT STANDARDS		# of Items
Ph	PHYSIOLOGY (continued)	10 items
3	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:	
<i>a</i>	<i>Students know</i> how the complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide.	3
<i>b</i>	<i>Students know</i> how the nervous system mediates communication between different parts of the body and the body's interactions with the environment.	1
4	Organisms have a variety of mechanisms to combat disease. As a basis for understanding the human immune response:	
<i>a</i>	<i>Students know</i> the role of antibodies in the body's response to infection.	1
<i>b</i>	<i>Students know</i> how vaccination protects an individual from infectious diseases.	1
<i>c</i>	<i>Students know</i> 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.	1
I&E	INVESTIGATION AND EXPERIMENTATION	6 items
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 strands, students should develop their own questions and perform investigations. As a basis for understanding this concept. Students will:	
<i>a</i>	Construct appropriate graphs from data and develop qualitative statements about the relationships between variables.	
<i>b</i>	Recognize whether evidence is consistent with a proposed explanation.	
<i>c</i>	Communicate the logical connection among hypotheses, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence.	
<i>d</i>	Evaluate the accuracy and reproducibility of data.	
<i>e</i>	Distinguish between variable and controlled parameters in a test.	
<i>f</i>	Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.	
<i>g</i>	Distinguish between hypothesis and theory as scientific terms.	
<i>h</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).	
<i>i</i>	Recognize the issues of statistical variability and the need for controlled tests.	
	Total	60 items