

Biology Curriculum Guide

Sequoia Union High School District

Course: BIOLOGY

Description:

This is a full-year survey course. It incorporates the study of plants and animals and their interrelationships, the structure and function of living things, heredity and health maintenance, and an emphasis on laboratory experiences.

Prior-Learnings/Prerequisites:

Successful completion of Advanced Integrated Science is recommended.

Grade Level: 9th - 12th

Length of Course 1 Year

Units: 10 Units

Meets Requirements for:

- * **SUSHD Graduation**
- * **UC "a-g" Requirements**

Teacher Participants

Barbara Rausch
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Ann Akey
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Course Texts

(BVL) Biology: Visualizing Life, George B. Johnson
Holt, Rinehart, and Winston

(BMA) Biological Science: A Molecular Approach

Content Standards and Benchmarks	Curriculum Coverage Instructional Materials	Depth (+/-)	Sample Performance Activities
BIOLOGY SCIENCE AS INQUIRY			
Standard 1 Students understand and demonstrate the skills necessary to do scientific inquiry.			* Discuss why micropipets are used for bacterial transformations. * Standard lab report format for all labs
Description:			
1. Understand that scientific investigations follow a pattern of logical thinking.	BVL: Labs, hypothesis, record data All labs throughout the year BMA: Chpt 1	4.5	* Slime mold lab * Bacteria lab * Enzyme activity lab
2. Recognize that hypotheses are used in science for choosing what data to collect and for guiding the interpretation of the data.	BVL: Labs, hypothesis, record data All labs throughout the year BMA: Chpt 1, Supplemental Reading	4.5	* Plant growth lab * How to form a hypothesis
3. Formulate a testable hypothesis.	BVL: Labs, hypothesis, record data All labs throughout the year BMA: Chpt 1	5	
4. Design and conduct scientific investigations by: - identifying method, controls and variables - collecting and recording data - organizing and analyzing data (i.e., creating and interpreting graphs) - evaluating hypothesis and starting conclusions - making applications to the world	BVL: Labs, hypothesis, record data Ch 1, Pg 758 - Activity All labs throughout the year BMA: Chpt 1, Supplemental Readings	5	
5. Justify the selection and use of appropriate equipment and SI measurements in scientific investigations.	BVL: Labs, hypothesis, record data All labs throughout the year BMA: Chpt 1	5	
6. Understand that conceptual principles and knowledge guide scientific inquiries.	BVL: Labs, hypothesis, record data Demonstrate w/lab reports All labs throughout the year BMA: Chpt 1	5	
7: Demonstrate teamwork skills in planning and carrying out investigations and in generating and evaluating ideas.	BVL: Labs, hypothesis, record data Ongoing All labs throughout the year BMA: Chpt 1	5	

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SCIENTIFIC PRACTICES AND SKILLS			
<p>Standard 2 Students demonstrate scientific skills in a lab setting.</p> <p>Description:</p>			* Demonstrate proper use of microscopes in exploring pond water and meiosis in plant and animal cells.
1. Select and safely use appropriate techniques and instruments when participating in scientific and technological activities.	BVL: Lab safety Ongoing lab activities All labs throughout the year BMA: Text pgs. 602-611	5	* In small groups, share power supplies and microcentrifuges when conducting bacterial transformations.
2. Demonstrate a concern for safety and awareness of the direct and indirect consequences of their actions to self and others.	BVL: Lab safety Demonstrate skills-understanding All labs throughout the year BMA: Text pgs. 602-611	5	* Use proper dissection technique to identify the appearance and locations of tissues, vessels and organs in an earthworm, fetal pig or frog.

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PERSPECTIVES			
Standard 3 Students can analyze and discuss topics using a scientific perspective.			
Description:			
1. Understand the relationships among science, technology and society.	BVL: Internet, current events, projects Pg 38-40 Biology in the News BMA: Demonstrated Throughout the Year	4.5	* Summarize a current news article about a research practice and describe their opinion of the ethics of this practice. * Present to the class a current topic in biology by summarizing a current news article and will initiate a class discussion about that topic.
2. Understand and be able to critique the roles of science and technology in meeting personal and societal needs.	BVL: Internet, current events, projects Read articles from periodicals Discussion of ethics BMA: Demonstrated Throughout the Year	4.5	* After studying DNA fingerprinting, discuss and write opinions of the use of DNA in criminal investigations and to determine paternity.
3. Demonstrate scientific literacy and have the confidence to pursue further investigations and readings.	BVL: Internet, current events, projects All research papers ex GattaBVL movie/essay/DNA BMA: Demonstrated Throughout the Year	4.5	* Research - present on a genetic disorder and current advances in the field for treatment. * Frog Report * IMMEX: Ugly Gel

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CELL BIOLOGY			
Standard 4 Students know the cell is the basic unit of structure and function of all living organisms and is responsible for the continuity and diversity of life.			
Description:			
1. Understand how prokaryotic and eukaryotic cells as well as viruses differ in complexity and how plant and animal cells and bacteria differ in their general structure.	BVL: Lab, projects, models, tests Pg 53/324, Ch 18 PG 330-354 Text Ch 3 BMA: Chapt 6	4.5	* Write a balanced chemical equation that demonstrates an understanding of cellular respiration.
2. Explain that the cell is the basic of life. Cells have particular structures that help determine their function: - Cells are enclosed within semi-permeable membranes that regulate their interaction with their surroundings. - The central theme of molecular biology outlines the flow of information, from transcription of DNA in the nucleus to translation of proteins on ribosomes in the cytoplasm. - Eukaryotic cells are given shape and internal organization by a cytoskeleton and/or cell wall.	BVL: Lab, projects, models, tests Ch 8, Pg 41-75 Text Ch 3 BMA: Chapt 6	5	* Compare and contrast the energy output from carbohydrates, proteins and fats in relation to human metabolism
3.. Describe and explain energy transfer and transformations within the cell: - Usable energy is captured from sunlight by chloroplasts, and stored via the synthesis of sugar from carbon dioxide. - The role of microchondria, in making stored chemical blood energy available to cells, by completing the breakdown of glucose to CQ - How chemiosmotic gradients in the mitochondria and chloroplast store NRG for ATP production.	BVL: Lab, projects, models, tests Ch 5 Text Ch 5 BMA: Chapt 6	4	* Build and/or label a cell model and discuss an oganelle function. * In small groups, create a skit, video ro poster showing the synthesis of a protein, beginning with transcription of DNA.
4. Understand the role of macromolecules (polysaccharides, nucleic acids, protein, lipids).	BVL: Lab, projects, models, tests Ch 2, Pg 29-38 Text Ch 2, Chap 34.1, Video BMA: Chapt 2	3.5	* Building cell membranes * Osmosis lab * Photosynthesis lab * CD-Rom activities

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<p>GENETICS</p> <p>Standard 5 Students describe and explain genetic variation in a population as demonstrated by the process of mutation and sexual reproduction.</p> <p>Description:</p>			<ul style="list-style-type: none"> * Marshmallow meiosis * Create a family pedigree * Predict outcome of genetic crosses.
	<p>BVL: Exams, quizzes. Lab, voBVLbulary Ch7-8, How genes work Text Ch 7</p> <p>BMA: Chapt 12 - 16</p>	5	<ul style="list-style-type: none"> * Create a cartoon flip chart of a cell undergoing meiosis. * Deduce genotype (or genotypes) for 15 different traits based on data gathered about personal and parental phenotypes. * Identify the possible genders, genotypes and phenotypes of offspring through hypothetical mating.

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<p>GENETICS</p> <p>Standard 6 Students will describe how a multi-cellular organism develops from a single zygote; its phenotype depends on its genotype, which is established at fertilization.</p> <p>Description:</p>		5	<ul style="list-style-type: none"> * Marshmallow meiosis * Construct and analyze a Punnett Square for each of twenty different genetic cross problems. * Using a pool of hereditary characteristics, draw face of offspring.
<p>1. Understand how to predict the probable outcome of phenotypes in a genetic cross, given the genotypes of the parents and mode of inheritance (autosomal or x-linked, dominant or recessive).</p>	<p>BVL: Video, Lab, worksheets Pg 117-127, practice problems Genetic fast plant experiments BMA: Chapt 12 - 16</p>	5	<ul style="list-style-type: none"> * Construct and analyze a personal family pedigree
<p>2 Explain the genetic basis for Mendel's laws of segregation and independent assortment.</p>	<p>BVL: Design a pedigree, lab, video Pg 117-125 Text Ch 7 BMA: Chapt 12 - 16</p>	5	<ul style="list-style-type: none"> * Given specific genetic information and family relationships, construct a pedigree. * CD-0Rom Fly lab.
<p>3. Understand how to predict the probable mode of inheritance from a pedigree diagram that indicates phenotypes.</p>	<p>BVL: Exercises, vocabulary, reading Pg 117-125 Genetic problem sets BMA: Chapt 12 - 16</p>	4	

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GENETICS			
Standard 7 Students understand that genes are a set of instructions, encoded in the DNA sequence of each organism, specifying the sequence of amino acids in proteins characteristic of that organism. Description:			* Manipulate paper models to demonstrate protein synthesis beginning with transcription of DNA.
1. Understand how specialization of cells in multicellular organisms is usually due to different patterns in gene expression rather than to differences in the genes themselves.	BVL: Ch 8-9, protein structure Pg 146 Text Ch 8 BMA: Chapt 12 - 16	4.5	* Answer questions about the genetic basis for sickle cell anemia. * Protein synthesis simulation DNA-RNA-proteins.
2. Demonstrate that various proteins differ from one another in the number and sequence of amino acids.	BVL: Protein analysis, videos Translating proteins -insulin How hamburger turns into you BMA: Chapt 12 - 16	4.5	* Construct the protein for insulin given DNA sequence and using amino acid chart.
3. Explain how changes in or mutations in the DNA sequence of a gene may (or may not) affect the sequence of amino acids in the encoded protein, or the expression of the gene.	BVL: HuBMA genome project Ch 9 BMA: Chapt 12 - 16	4.5	* CD-Rom lab.
4. Demonstrate the general pathway by which ribosomes synthesize proteins, using trnas to translate genetic information in mrna.	BVL: Quizzes, worksheets, videos Ch 8 Readings, paper models BMA: Chapt 12 - 16	5	
5. Demonstrate how to apply the genetic coding rules to predict the sequence of amino acids from a sequence of codons in rna.	BVL: VoBVLbulary, thinking skills Ch 8 Readings, paper models BMA: Chapt 12 - 16	4.5	

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<p>GENETICS</p> <p>Standard 8 Students understand that the genetic composition of cells can be altered.</p> <p>Description:</p>			<p>* Construct models of DNA, RNA and protein out of various materials (i.e., straws, toothpicks, licorice, wood, marshmallows).</p> <p>* In small groups, make a presentation to the class describing replication and transcription.</p>
<p>1. Demonstrate the general structures and functions of DNA, RNA, and protein.</p>	<p>BVL: Chapter 8-9 Ch 8 Ch 2.8, lab, DNA activity BMA: Chapt 12 - 16</p>	4.5	<p>* Perform a bacterial transformation.</p>
<p>2. Understand how to apply base-pairing rules to explain copying of DNA during replication, and transcription of information from DNA into mRNA.</p>	<p>BVL: Directed reading, thinking skills BMA: Chapt 12 - 16 Ch 8 Paper models</p>	4.5	<p>* Demonstrate transformation using paper models.</p> <p>* Building models.</p>
<p>3. Describe how genetic engineering (biotechnology) is used to produce biomedical and agricultural products and will describe the advantages and disadvantages of these products.</p>	<p>BVL: Lab Bacterial transformation Ch 9, labs, reading, videos BMA: Chapt 12 - 16</p>	4.5	<p>* Research a biotech company.</p> <p>* Class discussion/debate genetically engineered foods.</p>
<p>4. Recognize the significance of bioethical issues involved in genetic engineering.</p>	<p>BVL: genetically modified food Ch 9 Bionics case studies BMA: Chapt 12 - 16</p>	4.5	<p>* Ethics and biotech - laser disk activity.</p> <p>* Bacterial transformation.</p>

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<p>ECOLOGY</p> <p>Standard 9 Students understand that stability in an ecosystem is a balance between competing factors.</p> <p>Description:</p>			<ul style="list-style-type: none"> * Biome posters -human impacts * Predator/prey lab (fox, mouse, seed) * Research and present posters on bio/geo/chemical cycles.
<p>1. Understand that life on earth is extremely diverse and is affected by environment.</p>	<p>BVL: Chap 14, 15, 16, 17, quizzes Ch 14, Biomes Biome study, jigsaw study BMA: Chapt 26</p>	5	<ul style="list-style-type: none"> * Participate in the simulation of food gathering by using different beak type "sticky worm" activity.
<p>2. Analyze changes in an ecosystem as a result of changes in the environment.</p>	<p>BVL: Exploitation of resources lab Ch 15-16, labs, environment Biome study BMA: Chapt 26</p>	4.5	<ul style="list-style-type: none"> * Write a letter to a legislative representative advocating a particular stance on an environmental issue and citing evidence for their stance.
<p>3. Explain the significance of water, carbon, nitrogen and oxygen cycles in relation to the ecosystem.</p>	<p>BVL: Food web & decomposers Ch 14, HuBMA impacts, diversity AIS- Plant station archives BMA: Chapt 26</p>	4.5	<ul style="list-style-type: none"> * Effects of acid rain on plants. * Food webs poster. * Create local food web.
<p>4. Analyze energy transformations in an ecosystem.</p>	<p>BVL: Service learning fieldwork Ch 14, Food webs AIS coverings BMA: Chapt 26</p>	5	<ul style="list-style-type: none"> * Pond CD-Rom * Rainforest CD-Rom * Dinograms Natural Selection * Hawks, Mice, Grass * Survivor (Role Play organisms Obtaining Food)

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<p>EVOLUTION</p> <p>Standard 10 Students understand that evolution is the result of genetic changes that occur in changing environments.</p> <p>Description:</p>			<p>* Simulate natural selection through various lab/activities, e.e., "Bird Beak", "Color" and "Camouflage", "predator-prey."</p> <p>* Construct a fossil pterosaur with comparisons of skeletal system made to modern animals.</p>
<p>1 Explain how natural selection determines survival rate of groups of organisms.</p>	<p>BVL: Reading, videos, voBVLbulary Ch 10 Bird beaks exercise BMA: Chapt 16 - 17</p>	5	<p>* Conduct accumulation lab on evolution by comparing the class vertebrata.</p>
<p>2 Recognize the significance of variations within a species.</p>	<p>BVL: Lab, videos Ch 10, Pg 768, explore 10A Class height data BMA: Chapt 16 - 17</p>	5	<p>* Research "Darwin's Finches" and compare the various species and determine how isolation, mutation and natural selection work to determine new species.</p>
<p>3 Describe how isolation, migration, mutation and natural selection affect speciation.</p>	<p>BVL: Dichotomous Keys Ch 10, adapt an aniBMAI, lab Population genetic games BMA: Chapt 16 - 17</p>	4.5	<p>* Study and analyze the "peppered moth" during the industrial revolution.</p>
<p>4. Analyze evidence (i.e., fossil, morphological, etc.) with regard to diversity, speciation or extinction.</p>	<p>BVL: Virtual field trip to Galapagos Ch 11-12 Skull labs, DNA evidence BMA: Chapt 16 - 17</p>	4.5	<p>* Skull lab.</p>

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STRUCTURE AND FUNCTION			
Standard 11 Students understand that homeostasis is a result of coordination of structure and function within organisms. Description:	Osmosis and diffusion Ento and exocytosis		* Expose Euglena to 50% salt solution and distilled water and 100% distilled water. Observations of the central vacuole will be given.
1. Describe how the complementary activities of major systems provide the cells with oxygen and nutrients and removes waste.	BVL: Ch 29, 30, 31, 32, 34, 35 Student chosen activity BMA: Chapt 18 - 24	4.5	* Use pencils to determine the distance between pressure receptors on the skin. * In a group, hold hands in a circle and alternate squeezing hands around the circle. Calculate the time it takes to travel the efferent and afferent pathway by dividing the time by the number of students.
2. Explain how the nervous system provides communication between different body parts and interactions with the environment.	BVL: Heart / lung models Ch 30 Student chosen activity BMA: Chapt 18 - 24	4.5	* Tugor pressure.
3. Demonstrate how nervous and endocrine feedback loops regulate homeostasis.	BVL: Design circuit board for stimuli Pg 601 Student chosen activity BMA: Chapt 18 - 24	4	* Leaf structure. * Osmosis.
4. Understand how plant structures maintain homeostasis.	BVL: HuBMA n body explorations Ch 21, Pg 390-408 Plant hormone lab BMA: Chapt 18 - 24	3.5	* Brain and Nervous System Model/Posters * Toothpicks to Identify Pressure Points * Models of Organs and Systems.

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<p>Structure and function in living systems</p> <p>Standard 12 Students understand that humans have a variety of mechanisms to combat disease.</p> <p>Description:</p>			<p>* In the study of AIDS, work cooperatively or individually in making poster presentations, information booklets and class oral presentations.</p> <p>* Research specific disease and make a class presentation on the disease - cause, symptoms, prevention, cure, etc.</p>
<p>1. Describe the role of the skin and other body systems in providing non-specific defense.</p>	<p>BVL: Vector presentation, Teen talk Dh 33, Pg 679 BMA: Chapt 20</p>	4.5	<p>* Have a variety of speakers representing various areas of Health Services make presentations to class.</p>
<p>2. Explain and diagram the role of antibodies in the human body.</p>	<p>BVL: Sex education, bacteria infections Ch 33 Pg 683-696 BMA: Chapt 20</p>	4	<p>* Make a 3-D model of virus or bacteria showing structure and labeling parts.</p>
<p>3. Compare and contrast bacteria and viruses with respect to: requirements for growth and replication, bodies defenses against each, and treatment(s) used to "fight" bacterial/viral infections.</p>	<p>BVL: Immunology skit, virus/antibody Ch 18, Pg 330-354 BMA: Chapt 20</p>	4.5	<p>* Conduct microscopic bacterial studies and bacterial growth labs.</p> <p>* Videos Demonstrating Immune System</p>
<p>4. Describe what consequences occur due to a compromised immune system (e.g., AIDS).</p>	<p>BVL: Ch 18, 19, 33 Pg 688-696 Transmission activities BMA: Chapt 20</p>	4.5	

<p>Core Textbooks and Instructional Material (See attached approved district list.)</p> <p>Holt Biology-Visualizing li Biology Visualizing Life</p> <p>Biology Visualizing Life Modern Bio (Internet) A.D.A.M. software (Funbrain) The Biology place</p>	<p>Prevention, Intervention and Extension Strategies (Include strategies to address students in ESL, GATE, Special Ed. Etc. How is instruction individualized?)</p> <p>Individual & group projects Opportunities for questioning & teaching among students Syookenebtak readubg fir ESK & GATE stydebts</p> <p>Use of SADAIE method in all classes sSeperate ELL class AP Bio for GATE Collaborate with special ed teachers</p> <p>Visual aids, demonstrations After school program Carlmont motivational center</p>
<p>Possible Correlation to Other Subject Areas (Where could content, skills, resources, teaching strategies overlap?)</p> <p>Social studies (biotech) English-reading literature and writing reports Math (some calculations)</p> <p>Writing reports, journals ε English-literature Collaborate with social st Brave New World Always connect to math Note writing and skills PowerPoing presentation Ethics-technology</p>	<p>Professional Resources (Websites, books, consultants, videos, etc.)</p> <p>Other biotexts CD-Rom software Videos www.access excellence.com Gene connection</p> <p>SMERC library Wev sites Teen talk - Sex education Borne disease lectures 650 344-8592 Gene connection</p> <p>County livrary resources Internet, books and videos</p>
<p>Potential Articulation with Other Programs (Community College, Tech Prep, ROP, Distance Learning, etc.)</p> <p>Articulation & partnerships with Canada college Partnership with Sequoia hospital Stanford health ed curriculum Stanford medical school</p> <p>Student projects related t School to career Meetings with Canada co College track ISME opportunities Phoenix program</p>	<p>Other Pertinent Information</p> <p>Address nutrition, reproduction, behavior</p>