LAB-AIDS CORRELATION TO

SOUTH CAROLINA

ACADEMIC STANDARDS AND PERFORMANCE INDICATORS FOR SCIENCE

HIGH SCHOOL

BIOLOGY 1

Science and Global Issues: Biology (SGI Biology) is written by the SEPUP group, at the Lawrence Hall of Science, University of California Berkeley, under the direction of Dr Barbara Nagle, SEPUP Director. Development of *SGI Biology* is supported by grants from the National Science Foundation.

This document was prepared by, Oralia Gil, LAB-AIDS Curriculum Specialist, and Mark Koker, Ph D, Director of Curriculum and Training at LAB-AIDS. SGI Biology is published by, and available exclusively from, LAB-AIDS, Ronkonkoma NY, 800.381.8003.

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Science in Global Issues Biology Unit Title	Student Book Pages	Issue Focus
Sustainability	1-46	Aspects of sustainability from a personal, community and global perspective
Ecology: Living on Earth	43-154	Sustainability from an ecosystems perspective, with a focus on humans' impacts on ecosystems Making decisions regarding fisheries management
Cell Biology: World Health	155-258	Disparities between developing and developed countries in terms of diseases' impacts on life Making decisions about priorities for diseases that limit social, economic, and environmental progress
Genetics: Feeding the World	259-412	Comparison of selective breeding and genetic modification Use of genetically modified organisms, particularly in the production of agricultural crops
Evolution: Maintaining Diversity	413-512	Conserving genetic, species and ecosystem diversity Ecosystems services and intrinsic value models for conservation

Key to SEPUP Assessment System:

SEPUP materials include research-based assessment system developed by SEPUP and the Berkeley Evaluation and Assessment Research Group (BEAR) in the University of California Graduate School of Education. Forming the core of the SEPUP Assessment System are the **assessment variables** (content and process skills to be assessed), **assessment questions or tasks** used to gather evidence and **scoring guides** for interpreting students' responses (correspond to assessment variables).

The seven assessment variables are:

Designing Investigations (DI)
Organizing Data (OD)
Analyzing Data (AD)
Understanding Concepts (UC)
Evidence and Trade-offs (ET)
Communication Skills (CS)
Group Interaction (GI)

Types of assessment:

Quick Checks (✔) present opportunities for informal formative assessment and may be used prior to instruction to find out what students know or think. They may also be used to help teachers track students' knowledge of key information or progress in understanding a concept.

Some embedded questions and tasks and all item bank questions are all suitable for summative assessment. Analysis questions are included at the end of each activity.

Citations included in the correlation document are as follows:

5 AQ 1-4 means that the standard or benchmark may be assessed using Analysis Questions 1-4 for Activity 5.

5: AQ 1-4, 5 UC means that in addition to AQ1-4, AQ 5 uses the Understanding Concepts scoring guide for Activity 5.

16 Proc UC means that the procedure (Proc) of Activity 16 contains an embedded task and uses the Understanding Concepts scoring guide.

For more information on program assessment and using SEPUP rubrics, consult the Teacher's Guide, TR part IV.

Note on Core Technology: *SGI Biology* has over 100 dedicated web links, resources and simulations online at CT http://www.sepuplhs.org/high/sgi/index.html; many activities have technology support not listed in this overview document. See also "Evaluating Media Resources," SE pp. 565-568. Additional CT available (on-line books, etc. at www.lab-aids.com

Standards	SEPUP Unit	Where assessed…
SCIENCE AND ENGINEERING PRACTICES		
Standard H.B.1: The student will use the science and engineering practices, including the processes and skills of scientific inquiry, to develop understandings of science content.		
H.B.1A. Conceptual Understanding: The practices of science and engineering support the development of science concepts, develop the habits of mind that are necessary for scientific thinking, and allow students to engage in science in ways that are similar to those used by scientists and engineers.		
Performance Indicators: Students who demonstrate this understanding can:		
H.B.1A.1 Ask questions to (1) generate hypotheses for scientific investigations, (2) refine models, explanations, or designs, or (3) extend the results of investigations or challenge scientific arguments or claims.	Occurs throughout units select examples include: Eco: 2, 11 Cell Bio: 8, 11 Gen: 8, 12	Select examples: 2 AQ 1-5; 11 AQ 8 8 AQ 2, 3; 11 AQ 5
H.B.1A.2 Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others.	Occurs throughout units select examples include: Sus: 5 Eco: 5, 7-9, 13-16 Cell Bio: 4, 5, 7, 8, 12-14, 16, 17 Gen: 3, 4, 6-8, 10, 12, 13, 16, 17 Evo: 1, 3, 5, 8, 11, 12	Select examples: 5 AQ 1-3 5 AQ 6; 7 AQ6; 13 AQ 4 7 AQ 2-4; 14 AQ 4; 16 AQ 5 3 AQ 3; 7 AQ 3; 12 AQ 3 1 AQ 6; 3 AQ 2-3; 12 AQ 2
H.B.1A.3 Plan and conduct controlled scientific investigations to answer questions, test hypotheses, and develop explanations: (1) formulate scientific questions and testable hypotheses based on credible scientific information, (2) identify materials, procedures, and variables, (3) use appropriate laboratory equipment, technology, and techniques to collect qualitative and quantitative data, and (4) record and represent data in an appropriate form. Use appropriate safety procedures.	Occurs throughout units select examples include: Sus: 5 Eco: 2, 6, 10, 11 Cell Bio: 2, 3, 7, 8, 11 Gen: 2, 9, 18 Evo: 8	Select examples: 5 AQ 1-3 6 AQ 3; 11 AQ 2-4 2 AQ 2; 3 AQ 1-4; 8 AQ 1-3 2 AQ 1-4; 9 AQ 1-5 8 AQ 1-3

Standards	SEPUP Unit	Where assessed…
H.B.1A.4 Analyze and interpret data from informational texts and data collected from investigations using a range of methods (such as tabulation, graphing, or statistical analysis) to (1) reveal patterns and construct meaning, (2) support or refute hypotheses, explanations, claims, or designs, or (3) evaluate the strength of conclusions.	Occurs throughout units select examples include: Sus: 1, 2, 5 Eco: 2, 3, 10-12, 14-16, 18, 19 Cell Bio: 1, 7, 8, 11 Gen: 4, 6-8, 16, 18, 20 Evo: 1, 11, 12	Select examples: 1 AQ 1-5; 2 AQ 1-7 2 AQ 1-7; 3 AQ 1-8; 16 AQ 1-5 1 AQ 1-3, 7 AQ 1-6 4 AQ 1-4; 16 AQ 3; 18 AQ 2 1 AQ 1-6; 11 AQ 1-4; 12 AQ 1-4
H.B.1A.5 Use mathematical and computational thinking to (1) use and manipulate appropriate metric units, (2) express relationships between variables for models and investigations, and (3) use grade-level appropriate statistics to analyze data.	Occurs throughout units select examples include: Sus: 1, 2 Eco: 2, 3, 6 Cell Bio: 1 Gen: 4, 6, 7, 20 Evo: 3, 8, 11, 12	Select examples: 1 AQ 1-5; 2 AQ 1-7 2 AQ 1-7; 3 AQ 1-8; 6 AQ 4, 5 1 AQ 1-3 4 AQ 1-4; 6 AQ 1 11 AQ 1-4; 12 AQ 1-4
H.B.1A.6 Construct explanations of phenomena using (1) primary or secondary scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams.	Occurs throughout units select examples include: Sus: 5 Eco: 2, 6, 10, 11 Cell Bio: 2, 3, 7, 8, 11 Gen: 2, 9, 18 Evo: 8	Select examples: 5 AQ 1-3 2 AQ 1-7; 6 AQ 4, 5; 11 AQ 5-7 2 AQ 1, 2; 3 AQ 1-4 2 AQ 1-4; 18 AQ 1-3 8 AQ 1-3
H.B.1A.7 Construct and analyze scientific arguments to support claims, explanations, or designs using evidence and valid reasoning from observations, data, or informational texts.	Occurs throughout units select examples include: Sus: 5, 6 Eco: 3-5, 7, 11 Cell Bio: 1, 2, 8, 13, 17, 18 Gen: 1, 5, 8, 15, 16, 18, 20 Evo: 5-15	Select examples: 6 AQ 1-9 3 AQ 5; 4 AQ 4; 5 AQ 7 1 AQ 1-3, 13 AQ 5; 17 AQ 2 5 AQ 3, 4; 15 AQ 1, 2; 16 AQ 4 5 AQ 3, 5; 6 AQ 1-3; 7 AQ 1
H.B.1A.8 Obtain and evaluate scientific information to (1) answer questions, (2) explain or describe phenomena, (3) develop models, (4) evaluate hypotheses, explanations, claims, or designs or (5) identify and/or fill gaps in knowledge. Communicate using the	Occurs throughout units select examples include: Sus: 5, 6 Eco: 1-4, 15, 16 Cell Bio: 1, 2, 6, 10, 11, 17, 18 Gen: 4, 7, 8, 15-17, 20 Evo: 6, 10, 14, 15	Select examples: 6 AQ 1-9 1 AQ 1-4; 15 AQ 1-4 1 AQ 1-3; 2 AQ 1-3; 18 AQ 1-4 4 AQ 1-4; 8 AQ 1-3; 20 AQ 1-4 6 AQ 1-3; 10 AQ 3, 10; 14 AQ 1

Standards	SEPUP Unit	Where assessed…
conventions and expectations of scientific writing or oral presentations by (1) evaluating grade-appropriate primary or secondary scientific literature, or (2) reporting the results of student experimental investigations.		
H.B.1B. Conceptual Understanding: Technology is any modification to the natural world created to fulfill the wants and needs of humans. The engineering design process involves a series of iterative steps used to solve a problem and often leads to the development of a new or improved technology.		
Performance Indicators: Students who demonstrate this understanding can:		
H.B.1B.1 Construct devices or design solutions using scientific knowledge to solve specific problems or needs: (1) ask questions to identify problems or needs, (2) ask questions about the criteria and constraints of the device or solutions, (3) generate and communicate ideas for possible devices or solutions, (4) build and test devices or solutions, (5) determine if the devices or solutions solved the problem and refine the design if needed, and (6) communicate the results.	Occurs throughout units select examples include: Sus: 1-5 Eco: 4, 5, 7, 15-19 Cell Bio: 1-3, 15-18 Gen: 1, 6, 13, 15, 16, 18-20 Evo: 1, 2, 9, 15	Select examples: 3 AQ 3; 5 AQ 3; 6 AQ 1, 7 4 AQ 3, 4; 5 AQ 10, 11; 15 AQ 5 15 AQ 2; 16 AQ 6; 17 AQ 2 1 AQ 4; 6 AQ 3; 15 AQ 1-3 15 AQ 1-4
CELLS AS A SYSTEM		
Standard H.B.2: The student will demonstrate the understanding that the essential functions of life take place within cells or systems of cells.		
H.B.2A. Conceptual Understanding: The essential functions of a cell involve chemical reactions that take place between many different types of molecules (including carbohydrates, lipids, proteins and nucleic acids) and are catalyzed by enzymes.		
Performance Indicators: Students who demonstrate this understanding can:		
H.B.2A.1 Construct explanations of how the structures of carbohydrates, lipids, proteins, and nucleic acids (including DNA and RNA) are related to their functions in organisms.	Cell Bio: 7-10 Gen: 9-14	7 AQ 2, 4, 5 8 AQ 4 9 AQ 1 10 AQ 1-3 14 AQ 5
H.B.2A.2 Plan and conduct investigations to determine how various environmental factors (including temperature and pH) affect enzyme activity and the	Cell Bio 8, 11	8 AQ 1 11 AQ 4

Standards	SEPUP Unit	Where assessed…
rate of biochemical reactions.		
H.B.2B. Conceptual Understanding: Organisms and their parts are made of cells. Cells are the structural units of life and have specialized substructures that carry out the essential functions of life. Viruses lack cellular organization and therefore cannot independently carry out all of the essential functions of life.		
Performance Indicators: Students who demonstrate this understanding can:		
H.B.2B.1 Develop and use models to explain how specialized structures within cells (including the nucleus, chromosomes, cytoskeleton, endoplasmic reticulum, ribosomes and Golgi complex) interact to produce, modify, and transport proteins. Models should compare and contrast how prokaryotic cells meet the same life needs as eukaryotic cells without similar structures.	Cell Bio: 4-6	4 AQ 2 5 AQ 1 6 AQ 1-4
H.B.2B.2 Collect and interpret descriptive data on cell structure to compare and contrast different types of cells (including prokaryotic versus eukaryotic, and animal versus plant versus fungal).	Cell Bio 3-6	3 AQ 1-6 4 AQ 1 6 AQ 2
H.B.2B.3 Obtain information to contrast the structure of viruses with that of cells and to explain, in general, why viruses must use living cells to reproduce.	Cell Bio 2, 6, 9, 10, 13, 16	9 AQ 2-5 10 AQ 3 16 AQ 1-8
H.B.2C. Conceptual Understanding: Transport processes which move materials into and out of the cell serve to maintain the homeostasis of the cell.		
Performance Indicators: Students who demonstrate this understanding can:		
H.B.2C.1 Develop and use models to exemplify how the cell membrane serves to maintain homeostasis of the cell through both active and passive transport processes.	Cell Bio: 6-9	7 AQ 1-4 9 AQ 5
H.B.2C.2 Ask scientific questions to define the problems that organisms face in maintaining homeostasis within different environments (including water of varying solute concentrations).	Cell Bio: 6-9	8 AQ 1-6
H.B.2C.3 Analyze and interpret	Cell Bio: 6-9	7 AQ 1-4

Standards	SEPUP Unit	Where assessed…
data to explain the movement of molecules (including water) across a membrane.		8 AQ 1-5 9 AQ 1-4
H.B.2D. Conceptual Understanding: The cells of multicellular organisms repeatedly divide to make more cells for growth and repair. During embryonic development, a single cell gives rise to a complex, multicellular organism through the processes of both cell division and differentiation.		
Performance Indicators: Students who demonstrate this understanding can:		
H.B.2D.1 Construct models to explain how the processes of cell division and cell differentiation produce and maintain complex multicellular organisms.	Cell Bio: 13-15 Gen 3, 13	13 AQ 2, 3, 7 14 AQ 2, 4 3 AQ 1-4 13 AQ 1-4
H.B.2D.2 Develop and use models to exemplify the changes that occur in a cell during the cell cycle (including changes in cell size, chromosomes, cell membrane/cell wall, and the number of cells produced) and predict, based on the models, what might happen to a cell that does not progress through the cycle correctly.	Cell Bio 13	13 AQ 1-8
H.B.2D.3 Construct explanations for how the cell cycle is monitored by check point systems and communicate possible consequences of the continued cycling of abnormal cells.	Cell Bio: 13, 14	13 AQ 2-4 14 AQ 2
H.B.2D.4 Construct scientific arguments to support the pros and cons of biotechnological applications of stem cells using examples from both plants and animals.	Cell Bio: 14, 15	14 AQ 4 15 AQ 3
ENERGY TRANSFER		
Standard H.B.3: The student will demonstrate the understanding that all essential processes within organisms require energy which in most ecosystems is ultimately derived from the Sun and transferred into chemical energy by the photosynthetic organisms of that ecosystem.		
H.B.3A. Conceptual Understanding: Cells transform energy that organisms need to perform essential life functions through a complex sequence of reactions in which chemical energy is transferred from one system of interacting molecules to another.		
Performance Indicators: Students who demonstrate this understanding can:		
H.B.3A.1 Develop and use models to explain how chemical	Cell Bio: 11, 12	12 AQ 4-5

Standards	SEPUP Unit	Where assessed…
reactions among ATP, ADP, and inorganic phosphate act to transfer chemical energy within cells.		
H.B.3A.2 Develop and revise models to describe how photosynthesis transforms light energy into stored chemical energy.	Cell Bio 12 Eco 9-11	12 AQ 2-3 9 AQ 1, 3, 4 11 AQ 5, 9
H.B.3A.3 Construct scientific arguments to support claims that chemical elements in the sugar molecules produced by photosynthesis may interact with other elements to form amino acids, lipids, nucleic acids or other large organic molecules.	Cell Bio: 12 Eco: 9-11	12 AQ 1, 3 9 AQ 4
H.B.3A.4 Develop models of the major inputs and outputs of cellular respiration (aerobic and anaerobic) to exemplify the chemical process in which the bonds of molecules are broken, the bonds of new compounds are formed and a net transfer of energy results.	Cell 12 Eco 9-11	12 AQ 1, 4 9 AQ 2 11 AQ 6
H.B.3A.5 Plan and conduct scientific investigations or computer simulations to determine the relationship between variables that affect the processes of fermentation and/or cellular respiration in living organisms and interpret the data in terms of real-world phenomena.	Eco 10-12	10 AQ 1-6 11 AQ 1-4, 6, 8 12 AQ 3-7
HEREDITY – INHERITANCE AND VARIATION OF TRAITS		
Standard H.B.4: The student will demonstrate an understanding of the specific mechanisms by which characteristics or traits are transferred from one generation to the next via genes		
H.B.4A. Conceptual Understanding: Each chromosome consists of a single DNA molecule. Each gene on the chromosome is a particular segment of DNA. The chemical structure of DNA provides a mechanism that ensures that information is preserved and transferred to subsequent generations.		
Performance Indicators: Students who demonstrate this understanding can:		
H.B.4A.1 Develop and use models at different scales to explain the relationship between	Gen: 3-8, 14	3 AQ 2 4 AQ 3 8 AQ 4

Standards	SEPUP Unit	Where assessed…
DNA, genes, and chromosomes in coding the instructions for characteristic traits transferred from parent to offspring.		14 AQ 1
H.B.4A.2 Develop and use models to explain how genetic information (DNA) is copied for transmission to subsequent generations of cells (mitosis).	Cell Bio: 13 Gen: 3	13 AQ 2-5 3 AQ 1-4
H.B.4B. Conceptual Understanding: In order for information stored in DNA to direct cellular processes, a gene needs to be transcribed from DNA to RNA and then must be translated by the cellular machinery into a protein or an RNA molecule. The protein and RNA products from these processes determine cellular activities and the unique characteristics of an individual. Modern techniques in biotechnology can manipulate DNA to solve human problems.		
Performance Indicators: Students who demonstrate this understanding can:		
H.B.4B.1 Develop and use models to describe how the structure of DNA determines the structure of resulting proteins or RNA molecules that carry out the essential functions of life.	Gen: 9-12, 16, 17	10 AQ 1 12 AQ 1 16 AQ 1-5 17 AQ 1-3
H.B.4B.2 Obtain, evaluate and communicate information on how biotechnology (including gel electrophoresis, plasmid-based transformation and DNA fingerprinting) may be used in the fields of medicine, agriculture, and forensic science.	Gen: 1, 2, 11, 15, 18-20	1 AQ 1, 5 2 AQ 4 15 AQ 2 18 AQ 1-4 19 AQ 1-3 20 AQ 1-4
H.B.4C. Conceptual Understanding: Sex cells are formed by a process of cell division in which the number of chromosomes per cell is halved after replication. With the exception of sex chromosomes, for each chromosome in the body cells of a multicellular organism, there is a second similar, but not identical, chromosome. Although these pairs of similar chromosomes can carry the same genes, they may have slightly different alleles. During meiosis the pairs of similar chromosomes may cross and trade pieces. One chromosome from each pair is randomly passed on to form sex cells resulting in a multitude of possible genetic combinations. The cell produced during fertilization has one set of chromosomes from each parent.		
Performance Indicators: Students who demonstrate this understanding can:		
H.B.4C.1 Develop and use models of sex cell formation (meiosis) to explain why the DNA of the daughter cells is different from the DNA of the parent cell.	Gen: 13-14	13 AQ 1-4 14 AQ 5
H.B.4C.2 Analyze data on the variation of traits among individual organisms within a	Gen: 4-8	4 AQ 1-4 6 AQ 1-3 7 AQ 4-6

Standards	SEPUP Unit	Where assessed…
population to explain patterns in the data in the context of transmission of genetic information.	Evo: 10, 12	8 AQ 1-6 10 AQ 8-10 12 AQ 1
H.B.4C.3 Construct explanations for how meiosis followed by fertilization ensures genetic variation among offspring within the same family and genetic diversity within populations of sexually reproducing organisms.	Gen: 13-14	13 AQ 1-4 14 AQ 1-5
H.B.4D. Conceptual Understanding: Imperfect transmission of genetic information may have positive, negative, or no consequences to the organism. DNA replication is tightly regulated and remarkably accurate, but errors do occur and result in mutations which (rarely) are a source of genetic variation.		
Performance Indicators: Students who demonstrate this understanding can:		
H.B.4D.1 Develop and use models to explain how mutations in DNA that occur during replication (1) can affect the proteins that are produced or the traits that result and (2) may or may not be inherited.	Gen: 16, 17	16 AQ 3-5 17 AQ 6-7
ECOSYSTEM DYNAMICS		
Standard H.B.6: The student will demonstrate an understanding that ecosystems are complex, interactive systems that include both biological communities and physical components of the environment.		
H.B.6A. Conceptual Understanding: Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. Limiting factors include the availability of biotic and abiotic resources and challenges such as predation, competition, and disease.		
Performance Indicators: Students who demonstrate this understanding can:		
H.B.6A.1 Analyze and interpret data that depict changes in the abiotic and biotic components of an ecosystem over time or space (such as percent change, average change, correlation and proportionality) and propose hypotheses about possible relationships between the changes in the abiotic components and the biotic components of the environment.	Eco 3, 4, 6, 7	3 AQ 1-6 4 AQ 4 7 AQ 3-5
H.B.6A.2 Use mathematical and computational thinking to support claims that limiting factors affect the number of	Eco: 2, 6, 12-16	2 AQ 1-7 6 AQ 5 14 AQ 1-7 15 AQ 2

Standards	SEPUP Unit	Where assessed…
individuals that an ecosystem can support.		16 AQ 2
H.B.6B. Conceptual Understanding: Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged between the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes.		
Performance Indicators: Students who demonstrate this understanding can:		
H.B.6B.1 Develop and use models of the carbon cycle, which include the interactions between photosynthesis, cellular respiration and other processes that release carbon dioxide, to evaluate the effects of increasing atmospheric carbon dioxide on natural and agricultural ecosystems.	Eco: 8-9	8 AQ 3, 5 9 AQ 3, 6
H.B.6B.1 Analyze and interpret quantitative data to construct an explanation for the effects of greenhouse gases (such as carbon dioxide and methane) on the carbon cycle and global climate.	Eco: 8	8 AQ 4
H.B.6C. Conceptual Understanding: A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively stable over long periods of time. Fluctuations in conditions can challenge the functioning of ecosystems in terms of resource and habitat availability.		
Performance Indicators: Students who demonstrate this understanding can:		
H.B.6C.1 Construct scientific arguments to support claims that the changes in the biotic and abiotic components of various ecosystems over time affect the ability of an ecosystem to maintain homeostasis.	Eco: 1, 4, 7, 8, 12, 13, 14, 16, 17	12 AQ 4-7 16 AQ 5 17 AQ 4
H.B.6D. Conceptual Understanding: Sustaining biodiversity maintains ecosystem functioning and productivity which are essential to supporting and enhancing life on Earth. Humans depend on the living world for the resources and other benefits provided by biodiversity. Human activity can impact biodiversity.		
Performance Indicators: Students who demonstrate this understanding can:		
H.B.6D.1 Design solutions to reduce the impact of human activity on the biodiversity of an ecosystem.	Activities focused on developing possible solutions: Sus: 1-6 Eco: 4, 5, 7, 14-16, 18, 19 Gen: 1, 6, 15, 20 Evo: 1, 2, 9, 15	 3 AQ 3; 5 AQ 3; 6 AQ 1, 7 4 AQ 3, 4; 5 AQ 10, 11; 15 AQ 5 1 AQ 4; 6 AQ 3; 15 AQ 1-3 15 AQ 1-4