LAB-AIDS CORRELATIONS FOR
THE UTAH SCIENCE CORE CURRICULUM BIOLOGY[1]

Grades 10-12 – Biology

Science and Global Issues: Biology (SGI Biology) was developed 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. *SGI Biology* is published by, and available exclusively from, LAB-AIDS, Ronkonkoma NY, 800.381.8003

This document was prepared by Oralia Gil, Curriculum Specialist at LAB-AIDS. This is not an exhaustive document. It is designed to provide a general overview of the alignment of *SGI Biology* to the Utah science program standards, grades 9-12, for review and adoption purposes. Support for the state standards may be found at other locations besides those explicitly stated in this document.

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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.

Standards	Objectives	Indicators	Student Book[1]	Assessment[2]
STANDARD I: Students will understand that living organisms interact with one another and their environment.	**Objective 1:** Summarize how energy flows through an ecosystem	a. Arrange components of a food chain according to energy flow.	Eco 6	AQ 5 (AD)
			Eco 7	AQ 2, 3, & 4 (UC)
		b. Compare the quantity of energy in the steps of an energy pyramid.	Eco 7	
		c. Describe strategies used by organisms to balance the energy expended to obtain food to the energy gained from the food (e.g., migration to areas of seasonal abundance, switching type of prey based upon availability, hibernation or dormancy).	Eco 6	AQ 5 (AD)
			Eco 7	AQ 2, 3, & 4 (UC)
		d. Compare the relative energy output expended by an organism in obtaining food to the energy gained from the food (e.g., hummingbird - energy expended hovering at a flower compared to the amount of energy gained from the nectar, coyote - chasing mice to the energy gained from catching one, energy expended in migration of birds to a location with seasonal abundance compared to energy gained by staying in a cold climate with limited food).		
		e. Research food production in various parts of the world (e.g., industrialized societies'	Eco 5	AQ 11b (ET)
			Eco 15	AQ 4 (ET)
			Eco 18	Proc (ET)
			Eco 19	Proc (ET)

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Standards	Objectives	Indicators		
		greater use of fossil fuel in food production, human health related to food product).	Gen 1	AQ 4 (ET)
			Gen 7	
			Gen 15	AQ 2 (ET)
			Gen 20	Proc (ET)
	Objective 2: Explain relationships between matter cycles and organisms.	a. Use diagrams to trace the movement of matter through a cycle (i.e., carbon, oxygen, nitrogen, water) in a variety of biological communities and ecosystems.	Eco 8	AQ 3 (UC)
			Eco 9	AQ 3 & 6 (UC)
		b. Explain how water is a limiting factor in various ecosystems.	Water is a focus throughout Ecology Unit.	
		c. Distinguish between inference and evidence in a newspaper, magazine, journal, or Internet article that addresses an issue related to human impact on cycles of matter in an ecosystem and determine the bias in the article.	Eco 1	
			Eco 4	
		d. Evaluate the impact of personal choices in relation to the cycling of matter within an ecosystem (e.g., impact of automobiles on the carbon cycle, impact on landfills of processed and packaged foods).	Eco 8	
			Eco 12	AQ 3 & 7 (UC)
			Eco 18	Proc (ET)
			Eco 19	Proc (ET)
	Objective 3: Describe how interactions among organisms and their environment help shape ecosystems.	a. Categorize relationships among living things according to predator-prey, competition, and symbiosis.	Eco 13	AQ 3 (UC)

Standards	Objectives	Indicators		
		b. Formulate and test a hypothesis specific to the effect of changing one variable upon another in a small ecosystem.	Eco 10	Proc (DI)
			Eco 11	Proc (DI)
			Eco 12	
		c. Use data to interpret interactions among biotic and abiotic factors (e.g., pH, temperature, precipitation, populations, diversity) within an ecosystem.	Eco 2	AQ 1 (AD)
			Eco 10	AQ 4 (AD)
			Eco 11	
			Eco 12	
			Eco 14	AQ 6, 7, & 8 (AD)
			Eco 15	
			Eco 16	Proc (AD)
		d. Investigate an ecosystem using methods of science to gather quantitative and qualitative data that describe the ecosystem in detail.	Same as c above	
		e. Research and evaluate local and global practices that affect ecosystems.	Eco 4	AQ 4 (ET)
			Eco 12	
			Eco 15	AQ 4 (ET)
			Eco 16	
			Eco 18	Proc (ET)
			Eco 19	Proc (ET)
			Gen 1	AQ 4 (ET)
			Gen 7	
			Gen 15	AQ 2 (ET)
			Gen 20	Proc ET
			Cell 1	
			Cell 17	
			Cell 18	AQ 2 (ET)
STANDARD II: Students will understand that all	**Objective 1:** Describe the fundamental chemistry of	a. List the major chemical elements in cells (i.e., carbon, hydrogen, nitrogen, oxygen,	Appendix F	

Standards	Objectives	Indicators		
organisms are composed of one or more cells that are made of molecules, come from preexisting cells, and perform life functions.	living cells.	phosphorous, sulfur, trace elements).		
		b. Identify the function of the four major macromolecules (i.e., carbohydrates, proteins, lipids, nucleic acids).	Cell 4	AQ 2 (UC)
			Cell 9	AQ 3, 5, & 6 (UC)
			Cell 10	AQ 3 (UC)
			Gen 10	
		c. Explain how the properties of water (e.g., cohesion, adhesion, heat capacity, solvent properties) contribute to maintenance of cells and living organisms.		
		d. Explain the role of enzymes in cell chemistry.	Cell 10	
			Cell 11	
	Objective 2: Describe the flow of energy and matter in cellular function.	a. Distinguish between autotrophic and heterotrophic cells.	Cell 3	AQ 5 (UC)
			Cell 4	AQ 2 (UC)
			Cell 5	
		b. Illustrate the cycling of matter and the flow of energy through photosynthesis (e.g., by using light energy to combine CO_2 and H_2O to produce oxygen and sugars) and respiration (e.g., by releasing energy from sugar and O_2 to produce CO_2 and H_2O).	Eco 9	AQ 3 & 6 (UC)
			Cell 12	AQ 7 & 8 (UC)
		c. Measure the production of one or more of the products of either photosynthesis or respiration.	Eco 10	AQ 4 (AD), AQ 6 (UC)
				AQ 5, 6, & 7 (UC)
			Eco 11	AQ 3 & 7

Standards	Objectives	Indicators	Student Book[1]	Assessment[2]
				(UC)
			Eco 12	
	Objective 3: Investigate the structure and function of cells and cell parts.	a. Explain how cells divide from existing cells.	Cell 13	AQ 5 (UC)
			Cell 14	
			Gen 3	Proc (UC)
		b. Describe cell theory and relate the nature of science to the development of cell theory (e.g., built upon previous knowledge, use of increasingly more sophisticated technology).	Cell 6	
		c. Describe how the transport of materials in and out of cells enables cells to maintain homeostasis (i.e., osmosis, diffusion, active transport).	Cell 7	
			Cell 8	AQ 1 & 2 (AD)
			Cell 9	AQ 3, 5 & 6 (UC)
		d. Describe the relationship between the organelles in a cell and the functions of that cell.	Cell 4	
			Cell 5	
			Cell 6	
		e. Experiment with microorganisms and/or plants to investigate growth and reproduction.	Gen 2	
STANDARD III: Students will understand the relationship between structure and function of organs and organ systems.	**Objective 1:** Describe the structure and function of organs.	a. Diagram and label the structure of the primary components of representative organs in plants and animals (e.g., heart - muscle tissue, valves and chambers; lung - trachea, bronchial, alveoli; leaf - veins, stomata; stem - xylem, phloem, cambium; root - tip, elongation, hairs; skin		

Standards	Objectives	Indicators	Student Book[1]	Assessment[2]
		- layers, sweat glands, oil glands, hair follicles; ovaries - ova, follicles, corpus luteum).		
		b. Describe the function of various organs (e.g. heart, lungs, skin, leaf, stem, root, ovary).		
		c. Relate the structure of organs to the function of organs.		
		d. Compare the structure and function of organs in one organism to the structure and function of organs in another organism.		
		e. Research and report on technological developments related to organs.		
	Objective 2: Describe the relationship between structure and function of organ systems in plants and animals.	a. Relate the function of an organ to the function of an organ system.		

Standards	Objectives	Indicators	Student Book[1]	Assessment[2]
		b. Describe the structure and function of various organ systems (i.e., digestion, respiration, circulation, protection and support, nervous) and how these systems contribute to homeostasis of the organism.		
		c. Examine the relationships of organ systems within an organism (e.g., respiration to circulation, leaves to roots) and describe the relationship of structure to function in the relationship.		
		d. Relate the tissues that make up organs to the structure and function of the organ.		
		e. Compare the structure and function of organ systems in one organism to the structure and function in another organism (e.g., chicken to sheep digestive system; fern to peach reproductive system).		
STANDARD IV: Students will understand that genetic information coded in DNA is passed from parents to offspring by sexual and asexual reproduction.	**Objective 1:** Compare sexual and asexual reproduction.	a. Explain the significance of meiosis and fertilization in genetic variation.	Gen 13	
			Gen 14	AQ 1, 2 & 7 (UC)
		b. Compare the advantages/disadvantages of sexual and asexual reproduction to survival of species.	Gen 3	Proc (UC)
			Gen 14	AQ 1, 2 & 7 (UC)
		c. Formulate, defend, and support a perspective of a	Gen 1	AQ 4 (ET)

Standards	Objectives	Indicators	Student Book[1]	Assessment[2]
The basic structure of DNA is the same in all living things. Changes in DNA may alter genetic expression.		bioethical issue related to intentional or unintentional chromosomal mutations.	Gen 15	AQ 5 (ET)
			Gen 18	
			Gen 19	
			Gen 20	Proc (ET)
	Objective 2: Predict and interpret patterns of inheritance in sexually reproducing organisms.	a. Explain Mendel's laws of segregation and independent assortment and their role in genetic inheritance.	Gen 5	
			Gen 14	AQ 1, 2 & 7 (UC)
		b. Demonstrate possible results of recombination in sexually reproducing organisms using one or two pairs of contrasting traits in the following crosses: dominance/recessive, incomplete dominance, codominance, and sex-linked traits.	Gen 4	AQ 4 (UC)
			Gen 6	
			Gen 7	
			Gen 8	
		c. Relate Mendelian principles to modern-day practice of plant and animal breeding.	Gen 4	
			Gen 6	
			Gen 7	
		d. Analyze bioethical issues and consider the role of science in determining public policy.	Gen 1	AQ 4 (ET)
			Gen 15	AQ 5 (ET)
			Gen 18	
			Gen 19	
			Gen 20	Proc (ET)
	Objective 3: Explain how the structure and replication of DNA are essential to heredity and protein synthesis.	a. Use a model to describe the structure of DNA.	Gen 9	
			Gen 10	Proc (UC)

Standards	Objectives	Indicators	Student Book[1]	Assessment[2]
		b. Explain the importance of DNA replication in cell reproduction.	Gen 12	AQ 1 (UC)
		c. Summarize how genetic information encoded in DNA provides instructions for assembling protein molecules.	Gen 16	Proc (UC)
		d. Describe how mutations may affect genetic expression and cite examples of mutagens.	Gen 16	
			Gen 17	
		e. Relate the historical events that lead to our present understanding of DNA to the cumulative nature of science knowledge and technology.	Gen 11	
			Gen 12	
		f. Research, report, and debate genetic technologies that may improve the quality of life (e.g., genetic engineering, cloning, gene splicing).	Gen 1	AQ 4 (ET)
			Gen 15	AQ 5 (ET)
			Gen 18	
			Gen 19	
			Gen 20	Proc (ET)
			Cell 14	
			Cell 15	
STANDARD V: Students will understand that biological diversity is a result of evolutionary processes.	Objective 1: Relate principles of evolution to biological diversity.	a. Describe the effects of environmental factors on natural selection.	Evo 2	
			Evo 11	
			Evo 12	AQ 1 (UC)
		b. Relate genetic variability to a species' potential for adaptation to a changing environment.	Evo 11	
			Evo 12	AQ 1 (UC)
			Evo 13	AQ 2 (UC)
		c. Relate reproductive isolation to speciation.	Evo 10	AQ 2 & 3 (UC)
			Evo 12	

Standards	Objectives	Indicators	Student Book[1]	Assessment[2]
			Evo 13	
		d. Compare selective breeding to natural selection and relate the differences to agricultural practices.	Selective Breeding is focus throughout the Genetics Unit.	
	Objective 2: Cite evidence for changes in populations over time and use concepts of evolution to explain these changes.	a. Cite evidence that supports biological evolution over time (e.g., geologic and fossil records, chemical mechanisms, DNA structural similarities, homologous and vestigial structures).	Evo 3	Student Sheet 3.1
			Evo 5	
			Evo 6	
			Evo 7	
			Evo 8	
			Evo 11	
			Evo 12	
			Evo 13	
			Evo 14	
		b. Identify the role of mutation and recombination in evolution.	Evo 12	AQ 1 (UC)
		c. Relate the nature of science to the historical development of the theory of evolution.	Evo 4	
			Evo 6	
			Evo 8	
		d. Distinguish between observations and inferences in making interpretations related to evolution (e.g., observed similarities and differences in the beaks of Galapagos finches leads to the inference that they evolved from a common ancestor; observed similarities and differences in the structures of birds and reptiles leads to the inference that birds evolved from reptiles).	Evo 5	AQ (UC)
			Evo 7	AQ 3 & 4 (UC)
			Evo 8	AQ 1 (UC)

Standards	Objectives	Indicators	Student Book[1]	Assessment[2]
		e. Review a scientific article and identify the research methods used to gather evidence that documents the evolution of a species.	Evo. 9	
			Link to scientific article on SGI Teachers Activity Links webpage	
	Objective 3: Classify organisms into a hierarchy of groups based on similarities that reflect their evolutionary relationships.	a. Classify organisms using a classification tool such as a key or field guide.	Evo 6	
			Evo 7	AQ 3 & 4 (UC)
			Evo 8	AQ 1 (UC)
			Evo 9	
		b. Generalize criteria used for classification of organisms (e.g., dichotomy, structure, broad to specific).	Evo 6	
			Evo 7	AQ 3 & 4 (UC)
			Evo 8	AQ 1 (UC)
			Evo 9	
			Appendix G	
		c. Explain how evolutionary relationships are related to classification systems.	Evo 6	
			Evo 7	AQ 3 & 4 (UC)
			Evo 8	AQ 1 (UC)
			Evo 9	
		d. Justify the ongoing changes to classification schemes used in biology.	Evo 6	
			Evo 7	AQ 3 & 4 (UC)
			Evo 8	AQ 1 (UC)
			Evo 9	