LAB-AIDS CORRELATIONS FOR THE MINNESOTA 2009 STATE SCIENCE STANDARDS

GRADES 9-12 – BIOLOGY

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 Donna Parker, LAB-AIDS Senior Consultant, and Mark Koker, Ph D, Director of Curriculum and Training at LAB-AIDS. Both NAC and SGI Biology are published by, and available exclusively from, LAB-AIDS, Ronkonkoma NY, 800.381.8003.

For more information about this correlation or for questions about review copies, presentations, or any matters related to sales or service, please contact Darin Christianson, LAB-AIDS Regional Sales Manager at 507.301.3355, by email at darin@lab-aids.com, or visit us at www.lab-aids.com.

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	Reference Code	Benchmark	Student Book	Assessment
NATURE OF SCIENCE AND ENGINEERING Understand that science is a way of knowing about the natural world and is characterized by empirical criteria, logical argument and skeptical review.	9.1.1.1.1	Explain the implications of the assumption that the rules of the universe are the same everywhere and these rules can be discovered by careful and systematic investigation.	Throughout, see for example: Cells Activity 6 and 9 (fundamental structures and functions of cells) Gen Activity 11 (similarities of DNA structure and function in all life on earth) Evo Activities 4-6 (theory of evolution and principle of natural selection)	6 AQ 4 UC 9 AQ 3, 5, 6 UC 11 AQ 4 4 Act. 5 AQ 4, AQ 1 UC
	9.1.1.1.2	Understand that scientists conduct investigations for a variety of reasons, including: to discover new aspects of the natural world, to explain observed phenomena, to test the conclusions of prior investigations, or to test the predictions of current theories.	Eco Activity 2 Eco Activities 10-11 Cells Activity 3 Gen Activities 4-5	2 AQ 1 Proc GI 10 AQ 4, 6 11 AQ 5, 6, 8 3 AQ 2, AQ 5 UC 4 AQ 4
	9.1.1.1.3	Explain how the traditions and norms of science define the bounds of professional scientific practice and reveal instances of scientific error or misconduct. *For example:* The use of peer review, publications and presentations.	Cells Activity 1 Cells Activity 10 Cells Activities 15, 17 Cells Activity 18 Gen Activities 15, 20	1 Proc 10 AQ 3 UC 15: AQ 1-3 18 AQ 2 UC 15 Proc CS, GI 20 Proc AD, ET

Standards	Reference Code	Benchmark	Student Book	Assessment
	9.1.1.1.4	Explain how societal and scientific ethics impact research practices. *For example:* Research involving human subjects may be conducted only with the informed consent of the subjects.	Throughout, see for example: Cells Activity 15 Gen Activity 1 (GMO foods) Gen Activity 15 (stem cell research) Gen Activities 19, 20 (funding for sustainable practices in world health)	15 AQ 1-3 1 AQ 4 UC 15 AQ 2 20 Proc ET, AD
	9.1.1.1.5	Identify sources of bias and explain how bias might influence the direction of research and the interpretation of data. *For example:* How funding of research can influence questions studied, procedures used, analysis of data, and communication of results.	Throughout, see for example: Gen Activity 1 (Should farmers grow genetically modified corn?) Gen Activity 15 (Benefits/risks of GMO) Gen Activity 17 (GURT) Gen Activities 19, 20 (BioPharma – edile vaccines from GMOs)	1 AQ 4 15 AQ 2 17 AQ 6-7 20 Proc ET, AD
	9.1.1.1.6	Describe how changes in scientific knowledge generally occur in incremental steps that include and build on earlier knowledge.	Throughout, see for example: Cells Activity 6 Cells Activity 9	6 AQ 4 UC 9 AQ 3, 5, 6 UC 11 AQ 1-5

Standards	Reference Code	Benchmark	Student Book	Assessment
			Gen Activity 11 Evo Activities 3, 4 (Human Genome Project, Theory of Evolution, Development of cell theory)	
	9.1.1.1.7	Explain how scientific and technological innovations —as well as new evidence— can challenge portions of, or entire accepted theories and models including, but not limited to: cell theory, atomic theory, theory of evolution, plate tectonic theory, germ theory of disease, and the big bang theory.	Throughout, see for example: Cells Activity 6 Gen Activity 5 Gen Activity 12 Evo Activity 4 (Human Genome Project, Theory of Evolution, DNA replication, Development of cell theory, germ theory of disease)	6AQ 4 UC AQ 1 UC 4 AQ 2
Understand that scientific inquiry uses multiple interrelated processes to investigate and explain the natural world.	9.1.1.2.1	Formulate a testable hypothesis, design and conduct an experiment to test the hypothesis, analyze the data, consider alternative explanations and draw conclusions supported by evidence from the investigation.	Throughout, see for example these lab activities where students design their own investigations: Cells Activity 2 Cells Activity 10 Cells Activity 11	2 AQ 1, AQ 4 UC 10 Proc & AQ 6, AQ 3 UC 11 Proc & AQ 4 AD 9 Proc GI 7 AQ 3, 4 8 AQ 1 UC

Standards	Reference Code	Benchmark	Student Book	Assessment
			Gen Activities 9-10 Evo Activities 7-8	
	9.1.1.2.2	Evaluate the explanations proposed by others by examining and comparing evidence, identifying faulty reasoning, pointing out statements that go beyond the scientifically acceptable evidence, and suggesting alternative scientific explanations.	Gen Activity 15 Gen Activity 20 Evo Activities 4-5	15 AQ 2 Proc GI CS 20 Proc AD ET 4 AQ 2
	9.1.1.2.3	Identify the critical assumptions and logic used in a line of reasoning to judge the validity of a claim.	Throughout course	
	9.1.1.2.4	Use primary sources or scientific writings to identify and explain how different types of questions and their associated methodologies are used by scientists for investigations in different disciplines.	Throughout, the following examples include wet and dry labs, case studies, primary sources: Eco Activity 2 Eco Activity 15 Gen Activity 8 Evo Activities 4-5	2 AQ 5 Proc OD AQ 1 AD 15 Proc OD 4 AQ 2
Understand that science, technology, engineering and mathematics rely on each other to enhance knowledge and understanding.	9.1.3.4.1	Describe how technological problems and advances often create a demand for new scientific knowledge, improved mathematics and new technologies.	Throughout, see for example: Eco Activity 8 (carbon cycle and global climate change, GMOs, etc.) Gen Activity 1 Gen Activity 8	8 AQ 3 UC 1 AQ 4 ET, AQ 5 8 AQ 3-4
	9.1.3.4.2	Determine and use appropriate safety procedures, tools, computers and measurement instruments in	Safety notes given on all labs, see TG for additional	2 AQ 1 AQ 1 AD

Standards	Reference Code	Benchmark	Student Book	Assessment
		science and engineering contexts. *For example:* Consideration of chemical and biological hazards in the lab.	safety notes Eco Activity 2 Eco Activity 10 Cells Activity 11 Gen Activity 2	10 Proc, AQ 4 AD, AQ6 UC 11 Proc 2 Proc
	9.1.3.4.3	Select and use appropriate numeric, symbolic, pictorial, or graphical representation to communicate scientific ideas, procedures and experimental results.	Eco Activity 1 Eco Activity 4 Eco Activity 9-10 Evo Activity 4	1 Proc 4 Student Sheet Ec4 9 AQ 4 ET 10 Proc AQ 3, 6 UC 4 Student Sheet Ev4
	9.1.3.4.4	Relate the reliability of data to consistency of results, identify sources of error, and suggest ways to improve data collection and analysis. *For example*: Use statistical analysis or error analysis to make judgments about the validity of results.	Eco Activity 2 Eco Activities 10-11 Cells Activity 8 Evo Activity 6	2 AQ 1 AD 10 AQ 4, 6 UC 8 AQ 1 (AD), 2, 6
	9.1.3.4.5	Demonstrate how consistency and dimensional analysis can guide the calculation of quantitative solutions and verification of results.	Carbon cycle simulation (see www.sepuplhs.org), Eco 8	
	9.1.3.4.6	Analyze the strengths and limitations of physical,	Eco Activity 5	5 AQ 6 ET

Standards	Reference Code	Benchmark	Student Book	Assessment
		conceptual, mathematical and computer models used by scientists and engineers.	Cells Activity 7 Gen Activities 3, 7, 10, 13, 16 Evo Activity 3 Evo Activity 11	7 AQ 6 3 Proc UC, 16 Proc UC 3 11
LIFE SCIENCE CONTENT Understand that organisms use the interaction of cellular processes to as well as tissues and organ systems to maintain homeostasis.	9.4.1.1.1	Explain how cell processes are influenced by internal and external factors, such as pH and temperature, and how cells and organisms respond to changes in their environment to maintain homeostasis	Cells Activity 8 Cells Activity 11	8 AQ 1, 2 AD 11 AQ 4 AD
	9.4.1.1.2	Describe how the functions of individual organ systems are integrated to maintain homeostasis in an organism	Cells Activity 2 Cells Activity 7	2 AQ 4 UC 7 AQ 6
Understand that cells and cell structures have specific functions that allow an organism to grow, survive and reproduce.	9.4.1.2.1	Recognize that cells are composed primarily of a few elements (carbon, hydrogen, oxygen, nitrogen, phosphorus, and sulfur), and describe the basic molecular structures and the primary functions of carbohydrates, lipids, proteins and nucleic acids.	Cells Activity 9 Cells Activity 10 Gen Activity 10	9 AQ 3, 5, 6 UC 10 AQ 3 UC
	9.4.1.2.2	Recognize that the work of the cell is carried out primarily by proteins, most of which are enzymes, and that protein function depends on the amino acid sequence and the shape it takes as a consequence of the interactions between those amino acids.	Cells Activity 10	10 AQ 3 UC

Standards	Reference Code	Benchmark	Student Book	Assessment
	9.4.1.2.3	Describe how viruses, prokaryotic cells, and eukaryotic cells differ in relative size, complexity and general structure.	Cells Activities 4, 5, 6, 9	4 AQ 2 UC 5 AQ 1 UC 6 AQ 4 UC 9 AQ 3, 5, 6 UC
	9.4.1.2.4	Explain the function and importance of cell organelles for prokaryotic and/or eukaryotic cells as related to the basic cell processes of respiration, photosynthesis, protein synthesis and cell reproduction.	Cells Activities 6, 10, 12, 16	6 AQ 4 UC 10 AQ 3 UC 12 AQ 8 UC 16 AQ 3, 6
	9.4.1.2.5	Compare and contrast passive transport (including osmosis and facilitated transport) with active transport such as endocytosis and exocytosis.	Cells Activity 8 Cells Activity 9	8 AQ 1, 2 AD 9 AQ 3, 5, 6 UC
	9.4.1.2.6	Explain the process of mitosis in the formation of identical new cells and maintaining chromosome number during asexual reproduction.	Cells Activity 13 Gen Activity 3	13 AQ 5 3 Proc UC
Understand that the interrelationship and interdependence of organisms generate dynamic biological communities in ecosystems.	9.4.2.1.1	Describe factors that affect the carrying capacity of an ecosystem and relate these to population growth.	Eco Activity 14 Eco Activity 15 Eco Activity 16	14 AQ 6, 7, 8 15 AQ 1, 5 Proc OD
	9.4.2.1.2	Explain how ecosystems can change as a result of the introduction of one of more new species. *For example:* The effect of migration, localized evolution or disease organism.	Eco Activity 3 Eco Activity 4	3 AQ 5, 6 ET 4 AQ 4 ET
Understand that matter cycles and	9.4.2.2.1	Use words and equations to differentiate between the processes of photosynthesis and respiration in terms of	Eco Activity 9	9 AQ 3, 6 ET

Standards	Reference Code	Benchmark	Student Book	Assessment
energy flows through different levels of organization of living systems and the physical environment, as chemical elements are combined in different ways.		energy flow, beginning reactants and end products.	Eco Activity 10 Eco Activity 11 Cells 12	10 AQ 4, 6 UC 11 AQ 5, 6, 8 UC 12 AQ 7, AQ 8 UC
	9.4.2.2.2	Explain how matter and energy is transformed and transferred among organisms in an ecosystem, and how energy is dissipated as heat into the environment.	Eco Activity 7 Eco Activity 8	7 AQ 2-4 UC 8 AQ 3
Understand that genetic information found in the cell provides information for assembling proteins which dictate expression of traits in an individual.	9.4.3.1.1	Explain the relationships among DNA, genes and chromosomes.	Gen Activity 14	14 AQ 1 (UC), 2, 7
	9.4.3.1.2	In the context of a monohybrid cross, apply the terms phenotype, genotype, allele, homozygous and heterozygous.	Gen Activity 4	4 AQ 4 UC, Proc AD
	9.4.3.1.3	Describe the process of DNA replication and the role of DNA and RNA in assembling protein molecules.	Gen Activity 10 Gen Activities 12, 16	10 AQ 1, AQ 4 ET
Understand that variation within a species is the natural result of new inheritable characteristics	9.4.3.2.1	Use concepts from Mendel's laws of segregation and independent assortment to explain how sorting and recombination (crossing over) of genes during sexual reproduction (meiosis) increases the occurrence of variation in a species.	Gen Activities 6, 7, 13 Gen Activity 14	6 Proc GI 13 AQ 1 (UC), 2, 7

Standards	Reference Code	Benchmark	Student Book	Assessment
occurring from new combinations of existing genes or from mutations of genes in reproductive cells.	9.4.3.2.2	Use the processes of mitosis and meiosis to explain the advantages and disadvantages of asexual and sexual reproduction.	Gen Activities 3, 13 Gen Activity 14	3 Proc UC 13 AQ 1-2 AQ 1 UC, 2, 7
	9.4.3.2.3	Explain how mutations like deletions, insertions, rearrangements or substitutions of DNA segments in gametes may have no effect, may harm, or rarely may be beneficial, and can result in genetic variation within a species.	Gen Activity 16 Evo Activity 11 Evo Activity 12	16 Proc UC 11 AQ 2-4 12 AQ 1
Understand that evolution by natural selection is a scientific explanation for the history and diversity of life on Earth.	9.4.3.3.1	Describe how evidence led Darwin to develop the theory of natural selection and common descent to explain evolution.	Evo Activity 4	4 AQ 1-3
	9.4.3.3.2	Use scientific evidence, including the fossil record, homologous structures, and genetic and/or biochemical similarities, to show evolutionary relationships among species.	Evo Activity 7 Evo Activity 8 Evo Activity 9 Evo Activity 13	7 AQ 3, 4 8 AQ 1 UC 9 AQ 1 13 AQ 1
	9.4.3.3.3	Recognize that artificial selection has led to offspring through successive generations that can be very different in appearance and behavior from their distant ancestors.	Evo Activity 14	14 AQ 1 UC, CS
	9.4.3.3.4	Explain why genetic variation within a population is essential for evolution to occur.	Evo Activity 11 Evo Activity 12 Evo Activity 13	11 AQ 1 12 AQ 2

Standards	Reference Code	Benchmark	Student Book	Assessment
	9.4.3.3.5	Explain how competition for finite resources and the changing environment promotes natural selection on offspring survival, depending on whether the offspring have characteristics that are advantageous or disadvantageous in the new environment.	Evo Activities 1 – 2 Evo Activity 12 Evo Activity 13	2 Proc GI 12 AQ 1 13 AQ 2
	9.4.3.3.6	Explain how genetic variation between two populations of a given species is due, in part, to different selective pressures acting independently on each population and how, over time, these differences can lead to the development of new species.	Evo Activity 2 Evo Activity 4 Evo Activity 8 Evo Activity 10	2 Proc GI 8 AQ 1 UC 10 AQ 2, 3 UC
Understand that human activity has consequences on living organisms and ecosystems.	9.4.4.1.1	Describe the social, economic, and ecological risks and benefits of biotechnology in agriculture and medicine. *For example:* Selective breeding, genetic engineering, and antibiotic development and use.	Gen Activity 1 Gen Activity 2 Gen Activity 15 Gen Activity 19, 20	1 AQ 4 15 AQ 2
	9.4.4.1.2	Describe the social, economic and ecological risks and benefits of changing a natural ecosystem as a result of human activity. *For example:* Changing the temperature or composition of water, air or soil; altering the populations and communities, developing artificial ecosystems; or changing the use of land or water.	Eco Activity 1 Eco Activity 4 Eco Activity 5 Eco Activity 7 Eco Activities 15, 16 Evo Activity 1, 2	 4 AQ 4 7 AQ 2-4 1 AQ 1

Standards	Reference Code	Benchmark	Student Book	Assessment
			Evo Activity 15	15 AQ 1 ET, CS
	9.4.4.1.3	Describe contributions from diverse cultures, including Minnesota American Indian tribes and communities, to the understanding of interactions among humans and living systems. *For example:* American Indian understanding of sustainable land use practices.	Local standard	
Understand that personal and community health can be affected by the environment, body functions and human behavior.	9.4.4.2.1	Describe how some diseases can sometimes be predicted by genetic testing and how this affects parental and community decisions.	Gen Activity 16	15 AQ 4-5
	9.4.4.2.2	Explain how the body produces antibodies to fight disease and how vaccines assist this process.	Cells Activity 16 Cells Activity 17 Gen Activity 19	16 AQ 6 17 AQ 2, Proc GI
	9.4.4.2.3	Describe how the immune system sometimes attacks some of the body's own cells and how some allergic reactions are caused by the body's immune responses to usually harmless environmental substances.		
	9.4.4.2.4	Explain how environmental factors and personal decisions, such as water quality, air quality and smoking affect personal and community health.	All Sustain Cells Activities 1, 2, 13, 17 Gen Activity 18	1 Proc GI 2 AQ 4 UC 13 Proc GI 17 Proc GI 18 AQ 2 CS
	9.4.4.2.5	Recognize that a gene mutation in a cell can result in uncontrolled cell division called cancer, and how exposure of cells to certain chemicals and radiation increases mutations and thus increases the chance of cancer.	Cells Activity 13	13 AQ 5 Proc GI