Example Proficiency Scale: HS-LS-1.1 DNA and Protein Synthesis

Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

Grade: 10 Biology

Score 4.0	In addition to score 3.0 performance, in-depth inferences and applications that go beyond what was taught. ● Apply principles of DNA and protein synthesis to a novel situation. Examples may include: – Describe the effects of a given error in the process. – Consider how the process would not work if DNA were a different structure. – Predict possible effects of a change in DNA sequence.
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.
Score 3.0	Target Goal/Learning Intention: ● Construct an explanation that gene coding is essential for carrying out the essential functions of life including: ○ How the structure of DNA allows for transcription. ○ How the structure of RNA and ribosomes allow for translation. ○ Why different cells use different genes at different times to make proteins needed for their special functions.
2.5	No major errors or omissions regarding 2.0 content, skills and/or processes and partial success of 3.0 content, skills and/or processes.
Score 2.0	Simpler Goal/Intention: ● Recognize and recall specific vocabulary such as mitosis, nucleotide, complementary, codon, anticodon, gene, amino acid, and protein. ● Describe the structure of DNA (double helix model) ● Summarize base-pairing. ● Compare the structure of RNA to DNA. ● Identify the purpose and product of DNA transcription. ● Identify the purpose and product of DNA translation. ● Identify the purpose and product of DNA replication. *(HS-LS-1.4)* ● Describe that all cells in a multicellular organism have identical copies of DNA, but are different because of differential gene expression. *(HS-LS-1.4)*
1.5	Partial demonstration of the 2.0 content, processes and/or skills but major errors or omissions regarding the 3.0 content, processes and/or skills.
Score 1.0	With help, partial demonstration of the 2.0 and 3.0 content, processes and/or skills.
0.5	With help, partial demonstration of the 2.0 content, processes and/or skills but not the 3.0 content, processes and/or skills.
Score 0.0	Even with help, no demonstration of content, processes and/or skills.

Example Proficiency Scale: HS-LS-1.2 Organization of Interacting Systems

Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Grade: 10 Biology

Score 4.0	In addition to score 3.0 performance, in-depth inferences and applications that go beyond what was taught. ● Apply principles of system organization to predict how a change in the functionality of a system would affect another system or the organism. Examples may include: – Given a change to the functioning of a system, predict the impact to another system and/or the organism as a whole.
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.
Score 3.0	Target Goal/Learning Intention: ● Draw or build a model of at least two systems in a particular organism and use the model to describe: ○ Ways the functions of two different systems affect one another (including a scenario). ○ How the interaction between systems provides specific functions in multicellular organisms. ● Model components need to include: ○ The relevant parts/organs. ○ The processes completed by the system parts (e.g., transport fluids, motion). ○ The function of each included system for the organism.
2.5	No major errors or omissions regarding 2.0 content, skills and/or processes and partial success of 3.0 content, skills and/or processes.
Score 2.0	Simpler Goal/Intention: ● Recognize and recall specific vocabulary such as system, organ, tissue, cell, stimulus, and homeostasis. ● List the basic hierarchical (levels of) organization of a system within an organism. ● List the basic functions of systems in a particular organism (circulatory, respiratory, digestive, excretory, nervous, immune, integumentary, muscle-skeletal and reproductive systems). ● Give an example of systems that function together to maintain homeostasis in an organism. *(HS-LS-1.3)* ● Observe interactions of systems and look for correlations (reactions to other systems changing).
1.5	Partial demonstration of the 2.0 content, processes and/or skills but major errors or omissions regarding the 3.0 content, processes and/or skills.
Score 1.0	With help, partial demonstration of the 2.0 and 3.0 content, processes and/or skills.
0.5	With help, partial demonstration of the 2.0 content, processes and/or skills but not the 3.0 content, processes and/or skills.
Score 0.0	Even with help, no demonstration of content, processes and/or skills.

Example Proficiency Scale: HS-LS-1.5 Photosynthesis

Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

Grade: 10 Biology

Score 4.0	In addition to score 3.0 performance, in-depth inferences and applications that go beyond what was taught. ● Apply principles of photosynthesis to a novel situation. Examples may include: – Biofuel Project – Innovative solutions – Compare and contrast with cellular respiration
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.
Score 3.0	Target Goal/Learning Intention: ● Use a model to demonstrate: ○ The process of photosynthesis, ○ How light energy drives photosynthesis, ○ How the inputs are transformed to the outputs, and ○ How energy is stored.
2.5	No major errors or omissions regarding 2.0 content, skills and/or processes and partial success of 3.0 content, skills and/or processes.
Score 2.0	Simpler Goal/Intention: ● Recognize and recall specific vocabulary such as monomer, polymer, carbohydrates, chloroplast, ATP, carbon dioxide, oxygen, water, sugar, and photosynthesis. ● Recall the chemical equation for photosynthesis and its components, including light. ● Identify that carbohydrates are made up of C, H and O. *(HS-LS-1.6)* ● Recognize that energy changes form and matter cycles through biological and chemical processes. ● Identify how energy is transferred when chemical bonds are broken or formed.
1.5	Partial demonstration of the 2.0 content, processes and/or skills but major errors or omissions regarding the 3.0 content, processes and/or skills.
Score 1.0	With help, partial demonstration of the 2.0 and 3.0 content, processes and/or skills.
0.5	With help, partial demonstration of the 2.0 content, processes and/or skills but not the 3.0 content, processes and/or skills.
Score 0.0	Even with help, no demonstration of content, processes and/or skills.

Example Proficiency Scale: HS-LS-1.7 Cellular Respiration

Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

Grade: 10 Biology

Score 4.0	In addition to score 3.0 performance, in-depth inferences and applications that go beyond what was taught. ● Apply principles of cellular respiration to a novel situation. Examples may include: – Stopped breathing – Under water – Higher altitude/space – Temperature affects – Analyze output from various molecules – Compare and contrast with photosynthesis
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.
Score 3.0	Target Goal/Learning Intention: ● Use a model to demonstrate: ○ the process of cellular respiration, ○ the importance of ATP in energy transfer, and ○ the importance of oxygen in cellular respiration. ○ how the inputs are transformed to the outputs. ○ how energy is released.
2.5	No major errors or omissions regarding 2.0 content, skills and/or processes and partial success of 3.0 content, skills and/or processes.
Score 2.0	Simpler Goal/Intention: ● Recognize and recall specific vocabulary such as cellular respiration, fermentation, aerobic, anaerobic, energy and mitochondria. ● Describe the chemical equation for cellular respiration and its components. ● Identify the difference between ADP and ATP. ● Identify the role of oxygen in cellular respiration. ● Identify the importance of cellular respiration. ● Recall that energy and matter cannot be created or destroyed but can change forms.
1.5	Partial demonstration of the 2.0 content, processes and/or skills but major errors or omissions regarding the 3.0 content, processes and/or skills.
Score 1.0	With help, partial demonstration of the 2.0 and 3.0 content, processes and/or skills.
0.5	With help, partial demonstration of the 2.0 content, processes and/or skills but not the 3.0 content, processes and/or skills.
Score 0.0	Even with help, no demonstration of content, processes and/or skills.

Example Proficiency Scale: HS-LS-2.3 Energy and Matter in Ecosystems

Construct an explanation using mathematical representation to support claims for the flow of energy through trophic levels and the cycling of matter in an ecosystem.

Grade: 10 Biology

Score 4.0	In addition to score 3.0 performance, in-depth inferences and applications that go beyond what was taught. ● Apply principles of matter cycling and energy flow to predict outcomes when a change happens in an ecosystem. Examples may include: – Remove or add a species to the food web and predict resulting changes.
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.
Score 3.0	Target Goal/Learning Intention: ● Construct an explanation using mathematical representations to support the claims that: ○ matter cycles throughout ecosystems, and ○ energy flows through trophic levels.
2.5	No major errors or omissions regarding 2.0 content, skills and/or processes and partial success of 3.0 content, skills and/or processes.
Score 2.0	Simpler Goal/Intention: ● Recognize and recall specific vocabulary such as ecosystem, trophic level, food web, biomass, matter, and energy. ● Name and describe the roles of organisms in each trophic level. (e.g., decomposer, producer, primary consumer, secondary consumer, tertiary consumer). ● Describe how autotrophs and heterotrophs differ in obtaining energy. ● Summarize how energy and matter are stored in biomass and transferred from one trophic level to the next. ● Summarize cycles of matter in an ecosystem i.e., carbon, oxygen, nitrogen, and hydrogen.) (*HS-LS-2.4*)
1.5	Partial demonstration of the 2.0 content, processes and/or skills but major errors or omissions regarding the 3.0 content, processes and/or skills.
Score 1.0	With help, partial demonstration of the 2.0 and 3.0 content, processes and/or skills.
0.5	With help, partial demonstration of the 2.0 content, processes and/or skills but not the 3.0 content, processes and/or skills.
Score 0.0	Even with help, no demonstration of content, processes and/or skills.

Example Proficiency Scale: HS-LS-2.5 Ecosystem Stability

Evaluate the claims, evidence, and reasoning that changing the conditions of a static ecosystem may result in a new ecosystem.

Grade: 10 Biology

Score 4.0	In addition to score 3.0 performance, in-depth inferences and applications that go beyond what was taught. ● Apply principles of ecosystem stability and ecosystem change to predict outcomes for a particular ecosystem given a novel scenario. Examples may include: – Student makes CER on prediction for the future of an ecosystem. – Novel scenarios could be student or teacher selected.
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.
Score 3.0	Target Goal/Learning Intention: ● Evaluate the evidence and reasoning used to support claims regarding: ○ Factors in an ecosystem that contribute to its stability. ○ That changing conditions of an ecosystem may result in a new ecosystem.
2.5	No major errors or omissions regarding 2.0 content, skills and/or processes and partial success of 3.0 content, skills and/or processes.
Score 2.0	Simpler Goal/Intention: ● Recognize and recall specific vocabulary such as carrying capacity, stability, resilience, density-dependent, density-independent. ● Explain that an ecosystem maintains relatively constant numbers of organisms (e.g. population density, population size, population dispersity). ● Identify types of population growth (i.e., logistic growth, exponential growth) *(HS-LS-2.2)* ● Describe factors that limit population growth (e.g., carrying capacity, density-dependent factors, density-independent factors) *(HS-LS-2.1)* ● Identify examples of biotic and abiotic factors in an ecosystem ● Explain how complex relationships (e.g., symbiosis) can contribute to an ecosystem's stability. ● Identify factors that could affect the stability of an ecosystem (e.g., symbiosis, predator-prey relationships, human interference, ecosystem resilience/resistance) ● Explain why biodiversity is important to the health of an ecosystem. ● Identify events that cause primary and secondary succession (i.e., natural disturbances, human-caused disturbances) ● Describe the events of primary and secondary succession.
1.5	Partial demonstration of the 2.0 content, processes and/or skills but major errors or omissions regarding the 3.0 content, processes and/or skills.
Score 1.0	With help, partial demonstration of the 2.0 and 3.0 content, processes and/or skills.
0.5	With help, partial demonstration of the 2.0 content, processes and/or skills but not the 3.0 content, processes and/or skills.
Score 0.0	Even with help, no demonstration of content, processes and/or skills.

Example Proficiency Scale: HS-LS-3.2 Genetics and Heredity

Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

Grade: 10 Biology

Score 4.0	In addition to score 3.0 performance, in-depth inferences and applications that go beyond what was taught. ● Apply principles of genetic variation to a novel situation. Examples may include: – Human manipulation of genetic variation: ◆ Genetic engineering ◆ Biotechnology
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.
Score 3.0	Target Goal/Learning Intention: ● Make a claim about how inheritable genetic variations can be caused by: ○ Sexual reproduction and meiosis, ○ Viable errors during replication, and/or ○ The effects of environmental factors. ● Use relevant evidence to defend the claim.
2.5	No major errors or omissions regarding 2.0 content, skills and/or processes and partial success of 3.0 content, skills and/or processes.
Score 2.0	Simpler Goal/Intention: ● Recognize recall vocabulary such as mutation, meiosis, genome, homologous, crossing over, autosome, and sex-chromosome. ● List the types of DNA coding mutations and their effects. ● Identify environmental factors that can cause changes in DNA. ● Summarize the purpose and products of meiosis. (e.g., haploid/diploid) ● Identify types of mutations from meiosis errors. ● Use Punnett squares to predict the probability of a trait in offspring. (HS-LS-3-3) ○ Using Mendelian genetics ○ Using complex inheritance patterns (i.e., codominance, incomplete dominance, multiple alleles, sex-linked) ● Explain how polygenic inheritance increases variation. (e.g., skin, hair, and eye color) ● Describe how genotype determines the phenotype of an individual trait. (HS-LS-3.1) ● Use a karyotype to identify chromosomal abnormalities. ● Use a pedigree to identify the inheritance pattern of a trait. ● Explore ways that humans manipulate the genetic code.
1.5	Partial demonstration of the 2.0 content, processes and/or skills but major errors or omissions regarding the 3.0 content, processes and/or skills.
Score 1.0	With help, partial demonstration of the 2.0 and 3.0 content, processes and/or skills.
0.5	With help, partial demonstration of the 2.0 content, processes and/or skills but not the 3.0 content, processes and/or skills.
Score 0.0	Even with help, no demonstration of content, processes and/or skills.

Example Proficiency Scale: HS-LS-4.1 Lines of Evolution and Ancestry

Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

Grade: 10 Biology

Score 4.0	In addition to score 3.0 performance, in-depth inferences and applications that go beyond what was taught. ● Apply principles of evolution and ancestry to a novel situation. Examples may include: – Identify common ancestry using empirical evidence. – Determine how new evidence can change evolutionary classification.
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.
Score 3.0	Target Goal/Learning Intention: ● Communicate scientific information that common ancestry and biological evolution are supported by the following empirical evidence: ○ DNA sequences, ○ anatomical structures past to present, and ○ order of appearance of structures in embryological development.
2.5	No major errors or omissions regarding 2.0 content, skills and/or processes and partial success of 3.0 content, skills and/or processes.
Score 2.0	Simpler Goal/Intention: ● Recognize and recall specific vocabulary such as vestigial structure, homologous structure, analogous structure, evolution, embryology, and common ancestry. ● Explain evidence of divergent and convergent evolution. ● Summarize broad patterns of evolution (e.g., speciation, gradualism, punctuated equilibrium, coevolution, etc.). ● Describe how similarities in patterns of DNA show common ancestry. ● Identify examples of how anatomical structures of fossil and/or living organisms can be evidence of common ancestry. ● Identify examples of how patterns of embryological development are evidence for common ancestry.
1.5	Partial demonstration of the 2.0 content, processes and/or skills but major errors or omissions regarding the 3.0 content, processes and/or skills.
Score 1.0	With help, partial demonstration of the 2.0 and 3.0 content, processes and/or skills.
0.5	With help, partial demonstration of the 2.0 content, processes and/or skills but not the 3.0 content, processes and/or skills.
Score 0.0	Even with help, no demonstration of content, processes and/or skills.

Example Proficiency Scale: HS-LS-4.4 Adaptation of Populations

Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

Grade: 10 Biology

Score 4.0	In addition to score 3.0 performance, in-depth inferences and applications that go beyond what was taught. ● Apply principles of natural selection to predict population adaptations in a novel situation. Examples may include: – Impacts on a species from a specific biotic or abiotic change affecting their population. – Alien planet. – Geographic barrier. – New predator.
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.
Score 3.0	Target Goal/Learning Intention: ● Construct an explanation for how natural selection leads to adaptation of populations.
2.5	No major errors or omissions regarding 2.0 content, skills and/or processes and partial success of 3.0 content, skills and/or processes.
Score 2.0	Simpler Goal/Intention: ● Recognize and recall specific vocabulary such as fitness, natural selection, adaptation, gene pool, and sexual selection. ● Explain how natural selection works (e.g., overproduction, heritable variation, fitness, survival/reproduction). *(HS-LS-4.2)* ● Use graphical representation to identify modes of selection given an environmental situation (i.e., directional, stabilizing, disruptive). *(HS-LS-4.3)* ● Identify types of adaptations (i.e., structural, behavioral, physiological). *(HS-LS-2.7)* ● Identify the five conditions that can cause evolution to occur according to the Hardy-Weinberg principle. ● Identify patterns of evolution that may lead to changes in allele frequencies due to genetic drift (i.e., founder effect, bottleneck effect). *(HS-LS-4.5)* ● Explain how speciation can occur due to different types of isolation (e.g., temporal, geographic, behavioral, reproductive/mechanical). *(HS-LS-4.5)* ● Explain that evolution happens at the population level, not the individual level.
1.5	Partial demonstration of the 2.0 content, processes and/or skills but major errors or omissions regarding the 3.0 content, processes and/or skills.
Score 1.0	With help, partial demonstration of the 2.0 and 3.0 content, processes and/or skills.
0.5	With help, partial demonstration of the 2.0 content, processes and/or skills but not the 3.0 content, processes and/or skills.
Score 0.0	Even with help, no demonstration of content, processes and/or skills.