Example Proficiency Scale: MS-LS-1.2 Cellular Function

Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

Grade: 7 Life Science

Score 4.0	In addition to score 3.0 performance, in-depth inferences and applications that go beyond what was taught. • Apply knowledge of functions and interactions of cell parts to predict cellular responses based on a novel situation. Examples may include: – Predict the impact on a cell if 1 of the 5 organelles studied were removed. – If the external environment of a cell was changed, predict the impact it would have on the cell and its ability to maintain homeostasis. – Find or invent an organelle that could accomplish other functions a cell may need. – Explore relationships between organelles.
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.

Score 3.0	Target Goal/Learning Intention:
	• Develop a model to represent parts of a plant cell (nucleus, mitochondria, chloroplasts, cell wall, and cell membrane).
	• Use a model to describe:
	  ○ how the cell functions as a whole, and
	  ○ how the cell parts (organelles) contribute to the function of the whole cell (maintaining homeostasis).
	• Explain why the structures of plant and animal cells are different.

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 cell, function, organelle, semi-permeable, and homeostasis. • Explain the basic functions of cell parts (nucleus, mitochondria, chloroplasts, cell wall, and cell membrane). • List the differences in structures of plant and animal cells.
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.

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Example Proficiency Scale: MS-LS-1.3 Multicellular Systems

Make a claim supported by evidence for how a living organism is a system of interacting subsystems composed of groups of cells.

Grade: 7 Life Science

Score 4.0	In addition to score 3.0 performance, in-depth inferences and applications that go beyond what was taught. ● Apply principles of multicellular systems to a novel situation. Examples may include: – Effects of added chemicals on plant health. – How do organisms react to transplanted organs or to failing subsystems? – How do organism subsystems react to environmental changes (e.g., stress, temperature, air composition, etc.)? – In a novel organism, prove that they have interacting systems/subsystems.
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 a scientific explanation that includes: ○ a claim about how systems and subsystems work together in a multicellular organism, ○ specific evidence of how two or more subsystems and their groups of cells (e.g., tissues, organs) work together to perform the functions of life, and ○ reasoning to connect evidence to the ideas in the explanation. *Note: organism can include any life form (e.g., plants, animals)*
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 cell, tissue, organ, organ system, and organism. ● Summarize that the levels of organization (cell, tissue, organ, organ system) leads to an organism being a group of subsystems working together. ● Describe that specialized cells, tissues, organs, and organ systems have specific functions within the organism.
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: MS-LS-1.4 Characteristics of Life

Construct a scientific argument based on evidence to defend a claim of life for a specific object or organism.

Grade: 7 Life Science

Score 4.0	In addition to score 3.0 performance, in-depth inferences and applications that go beyond what was taught. ● Construct a scientific argument to support or refute a claim of life for an uncommon or unfamiliar object or organism. Examples may include: – Students construct a claim with evidence and deep reasoning to defend why something is or is not living in a novel scenario. (apples, egg, seed, virus, hair, shells, alien creature, robot, dancing plant, AI, Alexa…) – Are there characteristics of living things that are not covered in this class that should be?
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 a scientific argument that includes: 　○ a claim of how the structure and characteristics of a specific organism or object allows it to function as a living thing (should be common/familiar). 　○ evidence to support the claim for each characteristic of life, and 　○ reasoning to connect evidence to 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 and recall specific vocabulary such as organism, stimulus, response, growth, development, cell, and reproduction. ● Identify/define the accepted characteristics of life: 　○ Response to environment, 　○ Obtain and use energy, 　○ Growth and development, 　○ Made of cells, 　○ Chemicals of life (Carbohydrates, lipids, proteins, nucleic acids) 　○ Reproduction. ● Describe that organisms are made of either one cell or many different numbers and types of cells. *(MS-LS-1.1)* ● Distinguish between living and non-living things. *(MS-LS-1.1)*
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: MS-LS-1.5 Photosynthesis

Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

Grade: 7 Life Science

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: – Study how manipulation of reactants (i.e., light intensity/color/type, water, carbon dioxide) alters photosynthesis and apply results to a new scenario. – Design a plan to maximize the role of photosynthesis to clean air in a city, grow more food, reduce global temperature, etc.
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 of photosynthesis including: ○ the rearrangement of reactants into products, ○ how both products (oxygen and glucose) can be used by all living things, (plants, animals, and others) ○ the flow of energy within all living organisms originates with the Sun's energy. • Explanations are supported by examples (as evidence) and reasoning.
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 photosynthesis, reactants, products, energy, matter, molecule, and chemical reaction. • Recall reactants and products for photosynthesis. • Identify that photosynthesis captures energy from the Sun using chloroplasts/chlorophyll. • Identify that photosynthesis combines matter (carbon dioxide and water) into food molecules (glucose).
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: MS-LS-1.6 Cellular Respiration and Biomolecules

Develop a conceptual model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as matter moves through an organism.

Grade: 7 Life Science

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: – How does elevation affect the process of cellular respiration? – Explain "you are what you eat". – Abundance of mitochondria in muscle cells. – Develop a model of the relationships between photosynthesis and 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:
	• Draw or build a conceptual model to describe:
	  ○ how molecules are rearranged through chemical reactions,
	  ○ how energy is released through cellular respiration,
	  ○ conservation of matter.

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 reactants, products, cellular respiration, molecule, chemical reaction, energy, and matter. • Recall reactants and products for cellular respiration. • Identify that cellular respiration in mitochondria breaks bonds in food molecules (glucose) which releases energy. • Identify that food contains all the building blocks (molecules) necessary to build cells. • Understand the concept of conservation of matter, that molecules are broken apart and rearranged into new molecules.
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: MS-LS-2.3 Energy and Matter in Ecosystems

Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

Grade: 7 Life Science

Score 4.0	In addition to score 3.0 performance, in-depth inferences and applications that go beyond what was taught. ● Apply principles of energy and matter flow in an ecosystem to predict responses to a novel situation. Examples may include: – Predict effects to an ecosystem if there were a change in abiotic factors or biotic factors.
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.
Score 3.0	Target Goal/Learning Intention: ● Develop a model that includes: ○ the cycling of matter between living and non-living things, ○ the flow of energy between trophic levels in the system, and ○ the source of energy entering and leaving the system. ● Use the model to describe: ○ the movement of matter and flow of energy into and out of an ecosystem, ○ the movement of mass and flow of energy within an ecosystem (i.e., producers, consumers, decomposers), and ○ the 10% rule of energy and biomass transfer.
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 biotic, abiotic, food web, energy pyramid, producers, consumers, decomposer, and trophic levels. ● Explain what energy flow means. ● Identify producers, consumers and decomposers in a food chain. ● Identify the 10% rule of energy and biomass transfer. (MS-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: MS-LS-2.5 Ecosystem Populations

Construct an argument supported by evidence that changes to physical or biological components of an ecosystem affect population.

Grade: 7 Life Science

Score 4.0	In addition to score 3.0 performance, in-depth inferences and applications that go beyond what was taught. ● Apply principles of stability and change to predict how a novel situation would affect an ecosystem. Examples may include: – Biological changes: ◆ Invasive species, disease, or domestications – Physical changes: ◆ Climate change, urban sprawl, or drought
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 a scientific argument that includes: ○ a claim of how changes to physical and biological components of an ecosystem can affect the populations living there, ○ evidence to support the claim for both physical and biological components, and ○ reasoning to connect the evidence to 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 and recall specific vocabulary such as predation, competition, mutually beneficial, limiting factors, carrying capacity, population, ecosystem, and stability. ● Identify physical and biological components of an ecosystem. ● Explain that basic resources are needed for organisms to survive and that those resources may be limited. *(MS-LS-2.1)* ● Identify key relationships that occur between organisms (e.g., competition, predation, mutually beneficial, etc.). *(MS-LS-2.2)* ● Identify that changes to an ecosystem can result in changes in the populations that allow for stability (e.g., size, growth, survival).
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: MS-LS-3.1 Variation of Inheritable Traits

Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

Grade: 7 Life Science

Score 4.0	In addition to score 3.0 performance, in-depth inferences and applications that go beyond what was taught. ● Apply principles of mutation in a novel situation to explain how they lead to a beneficial, harmful, or neutral change in the traits of an organism. Examples may include: – Genetic disorder research – Analyzing karyotypes to determine mutations causing disorders. – Isolate the specific chromosomes/genes that result in the mutation and further explain the outcomes of the mutation.
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.
Score 3.0	Target Goal/Learning Intention: ● Develop a conceptual model that demonstrates: ○ a mutation has occurred (not to include specific molecular structure of DNA), and ○ the mutation affects the structure and function of the organism (not to include molecular protein structure, or protein synthesis). ● Use a model to describe: ○ why structural changes to genes (mutations) can result in changes to traits, and ○ why the results of mutations to genes can be beneficial, harmful, or neutral.
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 chromosome, gene, DNA, protein, trait, and mutation. ● Identify the relationship between a chromosome, gene, and DNA. ● Identify that genes are instructions for proteins. ● Identify that protein structure influences protein function. ● Explain that changes to the structure of a gene can result in changes to the function of proteins. ● Identify ways that changes in function of proteins can result in different traits in an organism. ● Identify that mutations can be harmful, neutral, or beneficial.
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: MS-LS-3.2 Inheritance

Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

Grade: 7 Life Science

Score 4.0	In addition to score 3.0 performance, in-depth inferences and applications that go beyond what was taught. ● Apply principles of inheritance (asexual and sexual reproduction) of a novel situation. Examples may include: – Use a model as evidence to argue which form of reproduction is most beneficial to the survival of a species: – Dihybrid Punnett Square – Codominance – Incomplete Dominance – Complex Pedigrees – Predict the mechanism of genetic change via asexual reproduction.
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.
Score 3.0	Target Goal/Learning Intention: ● Develop a model that demonstrates: ○ The effect of asexual reproduction on genetic inheritance, and ○ The effect of sexual reproduction on genetic inheritance. ● Use a model to describe: ○ Parent and offspring genetic relationships in asexual reproduction, ○ Parent and offspring genetic relationships in sexual relationships, ○ Cause and effect relationships between types of reproduction and level of genetic variation in offspring.
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 dominant allele, recessive allele, genotype, phenotype, inheritance, asexual reproduction, and sexual reproduction. ● Identify that offspring usually have the same number of chromosomes, and therefore genes, as their parents. ● Identify how the genetic results of sexual reproduction are different than the genetic results of asexual reproduction. ● Compare and contrast homozygous and heterozygous. ● Describe the resulting traits observed for various mixtures of dominant and recessive alleles. ● Identify the benefits of sexual and asexual reproduction.
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: MS-LS-4.2 Organism Relatedness

Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms.

Grade: 7 Life Science

Score 4.0	In addition to score 3.0 performance, in-depth inferences and applications that go beyond what was taught. • Apply the scientific principles of organism relatedness in a novel situation. Examples may include: – Classify life on another planet. – Utilize additional evidence such as DNA and/or embryology to compare relatedness.
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 infers relationships:
	  ○ Among modern living organisms.
	  ○ Between modern and fossil organisms.
	• Use evidence and reasoning to demonstrate:
	  ○ interpretation of patterns in the fossil record showing changes in life forms throughout the history of life on Earth, and
	  ○ patterns of similarities in anatomical structures across multiple species.

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 fossil, homologous structure, analogous structure, vestigial structure, anatomical, classification, and extinct. • Describe how patterns in the fossil record help organize the ages of fossils chronologically *(MS-LS-4.1).* • Identify evidence of anatomical similarities and differences between modern and fossil organisms. • Compare anatomical similarities among structures of different organisms. *(MS-LS-4.3)* • Identify evidence that anatomical similarities and differences indicate the amount of relatedness among modern organisms.
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: MS-LS-4.4 Natural Selection

Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.

Grade: 7 Life Science

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 a novel situation.
	
	Examples may include:
	    – Make predictions for future generation traits based on a scenario.
	    – Predict what situation might cause a trait to increase in a population over time.

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 based on evidence that describes:
	        ○ individuals in a species have genetic variation that can be passed on to their offspring,
	        ○ the traits of an organism cause them to be more or less likely to survive and reproduce, and
	        ○ Natural selection can cause populations to naturally develop adaptations over time.
	    ● Use reasoning to explain how this process applies to a real-life example.

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 natural selection, overproduction, genetic variation, competition, survival, adaptation, species, and environmental factors.
	    ● List the four components of the process of natural selection.
	    ● Identify how certain traits in a population are selected for in a specific environment.
	    ● Identify that advantageous traits become more common in a population over time. *(MS-LS-4.6)*

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.

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Example Proficiency Scale: MS-LS-4.5 Genetic Modification

Obtain, evaluate, and communicate information about how technologies allow humans to influence the inheritance of desired traits in organisms.

Grade: 7 Life Science

Score 4.0	In addition to score 3.0 performance, in-depth inferences and applications that go beyond what was taught. ● Apply the principles of genetic modification to novel situations. Examples may include: – Potential future ramifications or advances – Designer babies – Future food sources – Debate ethical implications
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.
Score 3.0	Target Goal/Learning Intention: ● Obtain information from reliable sources about how genetic modification practices and/or technologies allow humans to influence the inheritance of desired traits in organisms. ● Evaluate information to determine the influences these technologies have had on society. ● Communicate the information that was obtained and evaluated.
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 gene modification, artificial selection/selective breeding, genetic engineering, gene therapy, and evaluate. ● Identify ways in which humans use artificial selection to influence the traits of a variety of organisms (past and current). ● List types of genetic engineering technologies. ● Identify reasons that humans use genetic modification to change the inheritable traits of organisms. ● Recognize credible and reliable sources.
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.

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