**Life Sciences**

**MS-LS1 From Molecules to Organisms: Structures and Processes**

**MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.**

Further explanation: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.

Planning and carrying out investigations; structure and function; scale, proportion, and quantity

**MS-LS1-2 Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function.**

Further explanation: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.

Developing and using models; structure and function; structure and function

**MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting sub-systems composed of groups of cells.**

Further explanation: Emphasis is on conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of sub-systems within a system and the normal functioning of those systems.

Engaging in argument from evidence; structure and function; system and system models

**MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively.**

Further explanation: Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury. Potential Maine connections could include herding of white-tail deer and caribou, vocalizations of moose and cardinals, and keystone species such as those on the coast (e.g. harbor seals and sea stars).

Engaging in argument from evidence; growth and development of organisms; cause and effect

**MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.**

Further explanation: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting the growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than in small ponds. Examples could include winter and cold temperatures, hibernation (e.g. black bear), and the migration of hummingbirds and Canada geese.

Constructing explanations and designing solutions; growth and development of organisms; cause and effect

**MS-LS1-6 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.**

Further explanation: Emphasis is on tracing movement of matter and flow of energy.

Constructing explanations and designing solutions; organization for matter and energy flow in organisms; energy in chemical processes and everyday life; energy and matter

**MS-LS1-7 Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.**

Further explanation: Emphasis is on describing that molecules are broken apart and put back together and that in this process energy is released.

Developing and using models; organization for matter and energy flow in organisms; energy in chemical processes and everyday life; energy and matter

**MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.**

Obtaining, evaluating, and communicating information; information processing; cause and effect