

MS-LS1-2 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

MS-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. [Clarification Statement: 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.] [Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop and use a model to describe phenomena.

Disciplinary Core Ideas

LS1.A: Structure and Function

- Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.

Crosscutting Concepts

Structure and Function

- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function.

Observable features of the student performance by the end of the course:

1	Components of the model
a	To make sense of a phenomenon, students develop a model in which they identify the parts (i.e., components; e.g., nucleus, chloroplasts, cell wall, mitochondria, cell membrane, the function of a cell as a whole) of cells relevant for the given phenomenon.
2	Relationships
a	In the model, students describe the relationships between components, including: <ul style="list-style-type: none"> i. The particular functions of parts of cells in terms of their contributions to overall cellular functions (e.g., chloroplasts' involvement in photosynthesis and energy production, mitochondria's involvement in cellular respiration). ii. The structure of the cell membrane or cell wall and its relationship to the function of the organelles and the whole cell.
3	Connections
a	Students use the model to describe a causal account for the phenomenon, including how different parts of a cell contribute to how the cell functions as a whole, both separately and together with other structures. Students include how components, separately and together, contribute to: <ul style="list-style-type: none"> i. Maintaining a cell's internal processes, for which it needs energy. ii. Maintaining the structure of the cell and controlling what enters and leaves the cell. iii. Functioning together as parts of a system that determines cellular function.
b	Students use the model to identify key differences between plant and animal cells based on structure and function, including: <ul style="list-style-type: none"> i. Plant cells have a cell wall in addition to a cell membrane, whereas animal cells have only a cell membrane. Plants use cell walls to provide structure to the plant. ii. Plant cells contain organelles called chloroplasts, while animal cells do not. Chloroplasts allow plants to make the food they need to live using photosynthesis.