8/13/18

6th Grade Unit 6 (~22 Days)

From Molecules to Cells

Performance Expectations included in Unit 6

6-MS-PS1-1: Develop models to describe the atomic composition of simple molecules and extended structures.

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

6-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.

Unit 6 Anchor Phenomenon: Usain Bolt vs Cheetah

6-MS-PS1-1 (Matter and Its Interactions) Investigative Phenomenon: Water vs DNA

6-MS-PS1-1 (Matter and Its Interactions)

Develop models to describe the atomic composition of simple molecules and extended structures.

Clarification Statement

Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include carbon dioxide and water. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3-D models, or computer representations showing different molecules with different types of atoms.

Science and Engineering Practice	Disciplinary Core Idea
Developing and using models: Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop and/or use a model to describe phenomena.predict and/or	**STRUCTURE AND PROPERTIES OF MATTER** Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (MS.PS1A.a) Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS.PS1A.e)

Crosscutting Concepts

SCALE, PROPORTION, AND QUANTITY
Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Students should be able to: Expand their understanding of scale and of the need for units that express quantities of weight, time, temperature, and other variables.

Develop an understanding of estimation across scales and contexts. Using estimation can help them not only to develop a sense of the size and time scales relevant to various objects, systems, and processes but also to consider whether a numerical result sounds reasonable.

Content

Substances are made from different types of atoms.

Atoms are the basic unit of matter.

Substances combine with one another in various ways

Molecules are two or more atoms joined together.

Atoms form molecules that range in size from two to thousands of atoms.

Molecules can be simple or very complex.

Solids may be formed from molecules, or they may be extended structures with repeating subunits. (e.g. crystals)

All matter is composed of tiny particles called atoms.

Atoms are the basic unit of a chemical element.

Substances are made from different types of atoms.

Atoms form molecules ranging from small to very complex structures.

A molecule is a group of atoms that are joined together and act as a single unit.

Molecules can contain as many as a billion atoms or as few as two.

The arrangement, motion, and interaction of these particles determine the three states of matter (solid, liquid, and gas).

Solids have a definite volume and a definite shape.

Solids may be formed from molecules. Solids can be extended structures with repeating subunits. Repeating subunits can create crystal structures.

Salt, sugar, sand, and snow are examples of crystalline solids.

Ways to check for understanding

Develop a model of a simple molecule.

Use the model of the simple molecule to describe its atomic composition.

Develop a model of an extended structure.

Understand the powers-of-10 scales and what phenomena correspond to what scale, from the size of the nucleus of an atom to the size of the galaxy and beyond.

Use the model of the extended structure to describe its repeating subunits

Sample Guiding Questions

What is the atomic composition of some simple molecules?

What is the atomic position of some extended structures?

What is the atomic composition of ammonia?

What is the atomic composition of methanol?

What is the atomic composition of sodium chloride?

What is the atomic composition of diamonds?

Identify a model that shows an atom's nucleus is made of protons and neutrons, and is surrounded by electrons.

Identify a model that shows individual atoms of the same or different types that repeat to form compounds (e.g., sodium chloride).

Key Vocabulary

Atoms, protons, neutrons, electrons, ionic bonds, covalent bond, monomer, polymer, pure substances, Molecule (e.g. ammonia and methanol), Extended Structure (e.g. sodium chloride and diamonds), atomic number, electron cloud model, Bohr model, Lewis structure (electron dot), positive charge, negative charge, neutral charge, compound, molecule, polarity, Scale, proportion, and quantity

Sample 5E Lesson Plan

6-MS-PS1-1 Sample Lesson Plan

Additional Teacher Resources

PS1A - Structure and Properties of Matter

PS1B - Chemical Reactions

PS1C - Nuclear Processes

MS-PS1-1 NGSS Evidence Statement

Sample Activities

Better Lesson: Marshmallow Molecules

Changing State: Evaporation

Changing State: Condensation

What is Density

Finding Volume—The Water Displacement Method

Density of Water

Density—Sink and Float for Solids

Density—Sink and Float for Liquids

Water is a Polar Molecule

Surface Tension

Why Does Water Dissolve Salt?

Why Does Water Dissolve Sugar?

Using Dissolving to Identify an Unknown

Does Temperature Affect Dissolving?

Can Liquids Dissolve in Water?

Can Gases Dissolve in Water?

Assessment Tasks

NGSA Assessment Tasks

6-MS-LS1-1 (From Molecules to Organisms: Stucture and Processes) Investigative Phenomenon: Cells in the body

6-MS-LS1-1 (From Molecules to Organisms: Structure and Processes)

Conduct an investigation to provide evidence that living things are made of cells, either one or many different numbers and types.

Clarification Statement

Emphasis is on developing evidence that living things are made of cells, distinguishing between living and nonliving things, and understanding that living things may be made of one or many cells, including specialized cells. Examples could include animal cells (blood, muscle, skin, nerve, bone, or reproductive) or plant cells (root, leaf, or reproductive)

Concepts

Distinguish between living and nonliving things.

Cells are the smallest unit of life that can be said to be alive.

All living things are made up of cells, either one cell or many different numbers and types of cells.

Organisms may consist of one single cell (unicellular).

Nonliving things can be composed of cells.

skin, nerve, bone, or reproductive) or plant cells (root, leaf, or reproductive).

Science and Engineering Practice	Disciplinary Core Idea
Planning and carrying out investigations: Planning and carrying out investigations to answer questions (science) or test solutions (engineering) to problems in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions. • Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation.	**STRUCTURE AND FUNCTION** All living things are made up of cells, which are the smallest living unit. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS.LS1A.a)

Crosscutting Concepts
SCALE, PROPORTION, AND QUANTITY Phenomena that can be observed at one scale may not be observable at another scale. *Students should be able to: Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.* *Proportional relationships (e.g. speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes.* *Phenomena that can be observed at one scale may not be observable at another scale.* *The observed function of natural and designed systems may change with scale.* *Scientific relationships can be represented through the use of algebraic expressions and equations.*

Sample Guiding Questions
What evidence suggests that living things are made of cells?
What are some characteristics of a cell?
How many cells do living things have?
What kind of cells to living things have?

Key Vocabulary
nonliving, living, unicellular, multicellular, life, cells, prokaryotic, eukaryotic, biotic, abiotic, virus, structure, function, cell, tissue, organ, organ system, organism, plant cell, animal cell, scale

Ways to check for understanding
Organisms may consist of many different numbers and types of cells (multicellular).
Cells that can be observed at one scale may not be observable at another scale.
Engineering advances have led to important discoveries in the field of cell Biology
Scientific discoveries have led to the development of entire industries and engineered systems.
All living things are made up of cells.
The cell is the smallest living unit.
The cell is the fundamental unit of life.
An organism can consist of a single cell.
An organism can consist of many cells.
An organism can consist of many different types of cells.
Single-celled organisms are composed of one cell that can survive independently.
Multicellular organisms consist of individual cells that cannot survive independently.
Conduct an investigation to produce data that provides evidence distinguishing between living and nonliving things.
Conduct an investigation to produce data supporting the concept that living things may be made of one cell or many and varied cells.
Distinguish between living and nonliving things
Observe different types of cells that can be found in the makeup of living things.

Additional Teacher Resources
LS1A - Structure and Function
LS1B - Growth and Development
LS1C - Matter and Energy Flow in Organisms
LS1D - Information Processing
MS-LS1-1 NGSS Evidence Statement

Sample Activities
Better Lesson: Cells, Tissues, to Organs

Sample 5E Lesson Plan
6-MS-LS1-1 Sample Lesson Plan

6-MS-LS1-2 (From Molecules to Organisms: Stucture and Processes) Investigative Phenomenon: Iris contracting

6-MS-LS1-2 (From Molecules to Organisms: Structure and Processes)

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, such as the nucleus, chloroplasts, mitochondria, cell membrane, or cell wall.

Science and Engineering Practice	Disciplinary Core Idea
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/or use a model to predict and/or describe phenomena.	**STRUCTURE AND FUNCTION** Within cells, special structures (organelles) are responsible for particular functions. The cell membrane forms the boundary that controls the material(s) that enter and leave the cells in order to maintain homeostasis. (MS.LS1A.b)

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 shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.

Students should be able to: Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.

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

Sample Guiding Questions

What is the role of the nucleus in a cell?

What is the role of chloroplasts in a cell?

What is the role of mitochondria in a cell?

What is the role of the cell membrane?

What is the role of the cell wall?

Concepts

The cell functions as a whole system.

Identify parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.

Within cells, special structures are responsible for particular functions.

Within cells, the cell membrane forms the boundary that controls what enters and leaves the cell.

Complex and microscopic structures and systems in cells can be visualized, modeled, and used to describe how the function of the cell depends on the relationships among its parts.

Complex natural structures/systems can be analyzed to determine how they function.

A model can be used to describe the function of a cell as a whole.

A model can be used to describe how parts of cells contribute to the cell's function.

The structures of the cell wall and cell membrane are related to their function.

Organelles are structures within cells.

Most cells contain a set of observable structures called organelles which allow them to carry out life processes. Organelles perform specific functions.

A living cell depends on its organelles to function properly.

Major organelles include vacuoles, cell membrane, nucleus, and mitochondria. Plant cells are structurally and functionally different from animal cells.

Plants contain organelles such as cell wall and chloroplasts that are not found in animal cells.

A cell membrane surrounds every cell.

The cell membrane controls what goes in and out of a cell.

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.

A living cell maintains stable internal conditions (homeostasis) despite changes in its surroundings.

The functions of the organelles contribute to the cell's overall function as a whole (e.g., maintain the cells internal processes, the structure of the cell, what enters and leaves the cell, and overall cellular function).

Ways to check for understanding

What life systems are necessary to a cell?
How does a cell obtain nutrients?
How does a cell eliminate wastes?
How does a cell obtain energy?
How does a cell know how to build and repair itself?
Using a model(s), identify the function of a cell as a whole.
Using a model(s), identify special structures within cells are responsible for particular functions.
Using a model(s), identify the components of a cell.
Using a model(s), identify the functions of components of a cell.

Develop and use a model to describe the function of a cell as a whole.
Develop and use a model to describe how parts of cells contribute to the cell's function.
Develop and use models to describe the relationship between the structure and function of the cell wall and cell membrane.

Key Vocabulary

plant cell, animal cell, tissue, organ, organ system, organism, nucleus, chloroplast, mitochondria, cell membrane, cell wall, organelle, structure, function,

Additional Teacher Resources

LS1A - Structure and Function

LS1B - Growth and Development

LS1C - Matter and Energy Flow in Organisms

LS1D - Information Processing

MS-LS1-2 NGSS Evidence Statement

Sample 5E Lesson Plan

6-MS-LS1-2 Sample Lesson Plan

Sample Activities

Structure and function of cells, organs, and organ system Student Version

Structure and function of cells, organs, and organ system Teacher Version

Better Lesson: In and Out of Cells