NEXT GENERATION SCIENCE STANDARDS
For States, By States

HS-PS2-6

Students who demonstrate understanding can:

HS-PS2-6. **Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.*** [Clarification Statement: Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.] [*Assessment Boundary: Assessment is limited to provided molecular structures of specific designed materials.*]

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

Science and Engineering Practices

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 9–12 builds on K–8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.

- Communicate scientific and technical information (e.g., about the process of development and the design and performance of a proposed process or system) in multiple formats (including oral, graphical, textual and mathematical).

Disciplinary Core Ideas

PS2.B: Types of Interactions

- Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects.

Crosscutting Concepts

Structure and Function

- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem.

Observable features of the student performance by the end of the course:		
1	Communication style and format	
	a	Students use at least two different formats (including oral, graphical, textual and mathematical) to communicate scientific and technical information, including fully describing the structure, properties, and design of the chosen material(s). Students cite the origin of the information as appropriate.
2	Connecting the DCIs and the CCCs	
	a	Students identify and communicate the evidence for why molecular level structure is important in the functioning of designed materials, including:
		i. How the structure and properties of matter and the types of interactions of matter at the atomic scale determine the function of the chosen designed material(s); and
		ii. How the material's properties make it suitable for use in its designed function.
	b	Students explicitly identify the molecular structure of the chosen designed material(s) (using a representation appropriate to the specific type of communication — e.g., geometric shapes for drugs and receptors, ball and stick models for long-chained molecules).
	c	Students describe the intended function of the chosen designed material(s).
	d	Students describe the relationship between the material's function and its macroscopic properties (e.g., material strength, conductivity, reactivity, state of matter, durability) and each of the following:
		i. Molecular level structure of the material;
		ii. Intermolecular forces and polarity of molecules; and
		iii. The ability of electrons to move relatively freely in metals.
	e	Students describe the effects that attractive and repulsive electrical forces between molecules have on the arrangement (structure) of the chosen designed material(s) of molecules (e.g., solids, liquids, gases, network solid, polymers).
	f	Students describe that, for all materials, electrostatic forces on the atomic and molecular scale results in contact forces (e.g., friction, normal forces, stickiness) on the macroscopic scale.