

## HS-LS1-1

Students who demonstrate understanding can:

- HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.** *[Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]*

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

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Constructing Explanations and Designing Solutions</b></p> <p>Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.</p> <ul style="list-style-type: none"> <li>Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.</li> </ul>	<p><b>LS1.A: Structure and Function</b></p> <ul style="list-style-type: none"> <li>Systems of specialized cells within organisms help them perform the essential functions of life.</li> <li>All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. <i>(Note: This Disciplinary Core Idea is also addressed by HS-LS3-1.)</i></li> </ul>	<p><b>Structure and Function</b></p> <ul style="list-style-type: none"> <li>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.</li> </ul>

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

1	Articulating the explanation of phenomena								
	a Students construct an explanation that includes the idea that regions of DNA called genes determine the structure of proteins, which carry out the essential functions of life through systems of specialized cells.								
2	Evidence								
	a Students identify and describe the evidence to construct their explanation, including that: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20px;">i.</td> <td>All cells contain DNA;</td> </tr> <tr> <td>ii.</td> <td>DNA contains regions that are called genes;</td> </tr> <tr> <td>iii.</td> <td>The sequence of genes contains instructions that code for proteins; and</td> </tr> <tr> <td>iv.</td> <td>Groups of specialized cells (tissues) use proteins to carry out functions that are essential to the organism.</td> </tr> </table>	i.	All cells contain DNA;	ii.	DNA contains regions that are called genes;	iii.	The sequence of genes contains instructions that code for proteins; and	iv.	Groups of specialized cells (tissues) use proteins to carry out functions that are essential to the organism.
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	b Students use a variety of valid and reliable sources for the evidence (e.g., theories, simulations, peer review, students' own investigations).								
3	Reasoning								
	a Students use reasoning to connect evidence, along with the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future, to construct the explanation. Students describe the following chain of reasoning in their explanation: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20px;">i.</td> <td>Because all cells contain DNA, all cells contain genes that can code for the formation of proteins.</td> </tr> <tr> <td>ii.</td> <td>Body tissues are systems of specialized cells with similar structures and functions, each of whose functions are mainly carried out by the proteins they produce.</td> </tr> <tr> <td>iii.</td> <td>Proper function of many proteins is necessary for the proper functioning of the cells.</td> </tr> <tr> <td>iv.</td> <td>Gene sequence affects protein function, which in turn affects the function of body tissues.</td> </tr> </table>	i.	Because all cells contain DNA, all cells contain genes that can code for the formation of proteins.	ii.	Body tissues are systems of specialized cells with similar structures and functions, each of whose functions are mainly carried out by the proteins they produce.	iii.	Proper function of many proteins is necessary for the proper functioning of the cells.	iv.	Gene sequence affects protein function, which in turn affects the function of body tissues.
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