

HS-LS3-1

Students who demonstrate understanding can:

HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. *[Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]*

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>Asking Questions and Defining Problems</p> <p>Asking questions and defining problems in 9-12 builds on K-8 experiences and progresses to formulating, refining and evaluating empirically testable questions and design problems using models and simulations.</p> <ul style="list-style-type: none"> Ask questions that arise from examining models or a theory to clarify relationships. 	<p>LS1.A: Structure and Function</p> <ul style="list-style-type: none"> 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. <i>(secondary)</i> <i>(Note: This Disciplinary Core Idea is also addressed by HS-LS1-1.)</i> <p>LS3.A: Inheritance of Traits</p> <ul style="list-style-type: none"> Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function. 	<p>Cause and Effect</p> <ul style="list-style-type: none"> Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

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

1	Addressing phenomena or scientific theories
	a Students use models of DNA to formulate questions, the answers to which would clarify: <ol style="list-style-type: none"> i. The cause and effect relationships (including distinguishing between causal and correlational relationships) between DNA, the proteins it codes for, and the resulting traits observed in an organism; ii. That the DNA and chromosomes that are used by the cell can be regulated in multiple ways; and iii. The relationship between the non-protein coding sections of DNA and their functions (e.g., regulatory functions) in an organism.
2	Evaluating empirical testability
	a Students' questions are empirically testable by scientists.