

**DCI: From Molecules to Organisms:  
Structures and Processes**

**MS.LS1.B: Growth and  
Development of Organisms**

Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (MS-LS3-2)

**DCI: Heredity: Inheritance and Variation  
of Traits**

**MS.LS3.A: Inheritance of Traits**

Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1)

**DCI: Heredity: Inheritance and Variation  
of Traits**

**MS.LS3.A: Inheritance of Traits**

Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2)

**DCI: Heredity: Inheritance and Variation  
of Traits**

**MS.LS3.B: Variation of Traits**

In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2)

**DCI: Heredity: Inheritance and Variation  
of Traits**

**MS.LS3.B: Variation of Traits**

In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1)