Big Idea 3: Living systems store, retrieve, transmit and respond to information essential to life processes.

LO 3.1 The student is able to construct scientific explanations that use the structures and mechanisms of DNA and RNA to support the claim that DNA and, in some cases, that RNA are the primary sources of heritable information. [See SP 6.5]
LO 3.2 The student is able to justify the selection of data from historical investigations that support the claim that DNA is the source of heritable information. [See SP 4.1]
LO 3.3 The student is able to describe representations and models that illustrate how genetic information is copied for transmission between generations. [See SP 1.2]
LO 3.4 The student is able to describe representations and models illustrating how genetic information is translated into polypeptides. [See SP 1.2]
LO 3.5 The student can justify the claim that humans can manipulate heritable information by identifying at least two commonly used technologies. [See SP 6.4]
LO 3.6 The student can predict how a change in a specific DNA or RNA sequence can result in changes in gene expression. [See SP 6.4]
LO 3.7 The student can make predictions about natural phenomena occurring during the cell cycle. [See SP 6.4]
LO 3.8 The student can describe the events that occur in the cell cycle. [See SP 1.2]
LO 3.9 The student is able to construct an explanation, using visual representations or narratives, as to how DNA in chromosomes is transmitted to the next generation via mitosis, or meiosis followed by fertilization. [See SP 6.2]
LO 3.10 The student is able to represent the connection between meiosis and increased genetic diversity necessary for evolution. [See SP 7.1]
LO 3.11 The student is able to evaluate evidence provided by data sets to support the claim that heritable information is passed from one generation to another generation through mitosis, or meiosis followed by fertilization. [See SP 5.3]
LO 3.12 The student is able to construct a representation that connects the process of meiosis to the passage of traits from parent to offspring. [See SP 1.1, 7.2]
LO 3.13 The student is able to pose questions about ethical, social or medical issues surrounding human genetic disorders. [See SP 3.1]
LO 3.14 The student is able to apply mathematical routines to determine Mendelian patterns of inheritance provided by data sets. [See SP 2.2]
LO 3.15 The student is able to explain deviations from Mendel's model of the inheritance of traits. [See SP 6.5]
LO 3.16 The student is able to explain how the inheritance patterns of many traits cannot be accounted for by Mendelian genetics. [See SP 6.3]
LO 3.17 The student is able to describe representations of an appropriate example of inheritance patterns that cannot be explained by Mendel's model of the inheritance of traits. [See SP 1.2]
LO 3.18 The student is able to describe the connection between the regulation of gene expression and observed differences between different kinds of organisms. [See SP 7.1]
LO 3.19 The student is able to describe the connection between the regulation of gene expression and observed differences between individuals in a population. [See SP 7.1]
LO 3.20 The student is able to explain how the regulation of gene expression is essential for the processes and structures that support efficient cell function. [See SP 6.2]
LO 3.21 The student can use representations to describe how gene regulation influences cell products and function. [See SP 1.4]
LO 3.22 The student is able to explain how signal pathways mediate gene expression, including how this process can affect protein production. [See SP 6.2]

LO 3.23 The student can use representations to describe mechanisms of the regulation of gene expression. [See SP 1.4]
LO 3.24 The student is able to predict how a change in genotype, when expressed as a phenotype, provides a variation that can be subject to natural selection. [See SP 6.4, 7.2]
LO 3.25 The student can create a visual representation to illustrate how changes in a DNA nucleotide sequence can result in a change in the polypeptide produced. [See SP 1.1]
LO 3.26 The student is able to explain the connection between genetic variations in organisms and phenotypic variations in populations. [See SP 7.2]
LO 3.27 The student is able to compare and contrast processes by which genetic variation is produced and maintained in organisms from multiple domains. [See SP 7.2]
LO 3.28 The student is able to construct an explanation of the multiple processes that increase variation within a population. [See SP 6.2]
LO 3.29 The student is able to construct an explanation of how viruses introduce genetic variation in host organisms. [See SP 6.2]
LO 3.30 The student is able to use representations and appropriate models to describe how viral replication introduces genetic variation in the viral population. [See SP 1.4]
LO 3.31 The student is able to describe basic chemical processes for cell communication shared across evolutionary lines of descent. [See SP 7.2]
LO 3.32 The student is able to generate scientific questions involving cell communication as it relates to the process of evolution. [See SP 3.1]
LO 3.33 The student is able to use representation(s) and appropriate models to describe features of a cell signaling pathway. [See SP 1.4]
LO 3.34 The student is able to construct explanations of cell communication through cell-to-cell direct contact or through chemical signaling. [See SP 6.2]
LO 3.35 The student is able to create representation(s) that depict how cell-to-cell communication occurs by direct contact or from a distance through chemical signaling. [See SP 1.1]
LO 3.36 The student is able to describe a model that expresses the key elements of signal transduction pathways by which a signal is converted to a cellular response. [See SP 1.5]
LO 3.37 The student is able to justify claims based on scientific evidence that changes in signal transduction pathways can alter cellular response. [See SP 6.1]
LO 3.38 The student is able to describe a model that expresses key elements to show how change in signal transduction can alter cellular response. [See SP 1.5]
LO 3.39 The student is able to construct an explanation of how certain drugs affect signal reception and, consequently, signal transduction pathways. [See SP 6.2]
LO 3.40 The student is able to analyze data that indicate how organisms exchange information in response to internal changes and external cues, and which can change behavior. [See SP 5.1]
LO 3.41 The student is able to create a representation that describes how organisms exchange information in response to internal changes and external cues, and which can result in changes in behavior. [See SP 1.1]
LO 3.42 The student is able to describe how organisms exchange information in response to internal changes or environmental cues. [See SP 7.1]
LO 3.43 The student is able to construct an explanation, based on scientific theories and models, about how nervous systems detect external and internal signals, transmit and integrate information, and produce responses. [See SP 6.2, 7.1]
LO 3.44 The student is able to describe how nervous systems detect external and internal signals. [See SP 1.2]
LO 3.45 The student is able to describe how nervous systems transmit information. [See SP 1.2]
LO 3.46 The student is able to describe how the vertebrate brain integrates information to produce a

response. [See SP 1.2]
LO 3.47 The student is able to create a visual representation of complex nervous systems to describe/explain how these systems detect external and internal signals, transmit and integrate information, and produce responses. [See SP 1.1]
LO 3.48 The student is able to create a visual representation to describe how nervous systems detect external and internal signals. [See SP 1.1]
LO 3.49 The student is able to create a visual representation to describe how nervous systems transmit information. [See SP 1.1]
LO 3.50 The student is able to create a visual representation to describe how the vertebrate brain integrates information to produce a response. [See SP 1.1]