Big Idea 4: Biological systems interact, and these systems and their interactions possess complex properties.

Learning Objectives:
LO 4.1 The student is able to explain the connection between the sequence and the subcomponents of a biological polymer and its properties. [See SP 7.1]
LO 4.2 The student is able to refine representations and models to explain how the subcomponents of a biological polymer and their sequence determine the properties of that polymer. [See SP 1.3]
LO 4.3 The student is able to use models to predict and justify that changes in the subcomponents of a biological polymer affect the functionality of the molecule. [See SP 6.1, 6.4]
LO 4.4 The student is able to make a prediction about the interactions of subcellular organelles. [See SP 6.4]
LO 4.5 The student is able to construct explanations based on scientific evidence as to how interactions of subcellular structures provide essential functions. [See SP 6.2]
LO 4.6 The student is able to use representations and models to analyze situations qualitatively to describe how interactions of subcellular structures, which possess specialized functions, provide essential functions. [See SP 1.4]
LO 4.7 The student is able to refine representations to illustrate how interactions between external stimuli and gene expression result in specialization of cells, tissues and organs. [See SP 1.3]
LO 4.8 The student is able to evaluate scientific questions concerning organisms that exhibit complex properties due to the interaction of their constituent parts. [See SP 3.3]
LO 4.9 The student is able to predict the effects of a change in a component(s) of a biological system on the functionality of an organism(s). [See SP 6.4]
LO 4.10 The student is able to refine representations and models to illustrate biocomplexity due to interactions of the constituent parts.[See SP 1.3]
LO 4.11 The student is able to justify the selection of the kind of data needed to answer scientific questions about the interaction of populations within communities. [See SP 1.4, 4.1]
LO 4.12 The student is able to apply mathematical routines to quantities that describe communities composed of populations of organisms that interact in complex ways. [See SP 2.2]
LO 4.13 The student is able to predict the effects of a change in the community's populations on the community. [See SP 6.4]
LO 4.14 The student is able to apply mathematical routines to quantities that describe interactions among living systems and their environment, which result in the movement of matter and energy. [See SP 2.2]
LO 4.15 The student is able to use visual representations to analyze situations or solve problems qualitatively to illustrate how interactions among living systems and with their environment result in the movement of matter and energy. [See SP 1.4]
LO 4.16 The student is able to predict the effects of a change of matter or energy availability on communities.[See SP 6.4]
LO 4.17 The student is able to analyze data to identify how molecular interactions affect structure and function. [See SP 5.1]
LO 4.18 The student is able to use representations and models to analyze how cooperative interactions within organisms promote efficiency in the use of energy and matter. [See SP 1.4]
LO 4.19 The student is able to use data analysis to refine observations and measurements regarding the effect of population interactions on patterns of species distribution and abundance. [See SP 5.2]
LO 4.20 The student is able to explain how the distribution of ecosystems changes over time by identifying large-scale events that have resulted in these changes in the past. [See SP 6.3]
LO 4.21 The student is able to predict consequences of human actions on both local and global ecosystems. [See SP 6.4]

LO 4.22 The student is able to construct explanations based on evidence of how variation in molecular units provides cells with a wider range of functions. [See SP 6.2]
LO 4.23 The student is able to construct explanations of the influence of environmental factors on the phenotype of an organism. [See SP 6.2]
LO 4.24 The student is able to predict the effects of a change in an environmental factor on the genotypic expression of the phenotype. [See SP 6.4]
LO 4.25 The student is able to use evidence to justify a claim that a variety of phenotypic responses to a single environmental factor can result from different genotypes within the population. [See SP 6.1]
LO 4.26 The student is able to use theories and models to make scientific claims and/or predictions about the effects of variation within populations on survival and fitness. [See SP 6.4]
LO 4.27 The student is able to make scientific claims and predictions about how species diversity within an ecosystem influences ecosystem stability. [See SP 6.4]