|  |
| --- |
| 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.  |
| Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.  |
| Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.  |
| Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.  |
| Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.  |
| Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.  |
| Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.  |
| Use a mathematical representation to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.  |
| Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.  |
| Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.  |
| Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.  |
| Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.  |
| Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.\*  |
| Evaluate the evidence for the role of group behavior on individual and species’ chances to survive and reproduce.  |
| Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.\* Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.  |
| Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.  |
| Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.  |
| Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.  |
| Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.  |
| Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.  |
| Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.  |
| Construct an explanation based on evidence for how natural selection leads to adaptation of populations.  |
| Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.  |
| Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.  |
| Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.  |
| Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. |
| Design a solution to be complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. |