**Next Generation Science Standards-Common Core Standards**

**Course-Biology**

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**CORE IDEAS**

1. **Structure and Function**
   1. Specialized cells within organisms help them perform essential functions of life
      1. Water
      2. Protein
      3. Lipids
      4. Carbs
      5. Nucleic acids
   2. All cells contain genetic information
      1. Genes code for the formation of protein
      2. DNA molecules carry the code
   3. Multicellular organisms are made of hierarchical structural organization
      1. Cells
      2. Tissue
      3. Organ
      4. Organ systems
      5. Organisms
   4. Feedback mechanisms maintain homeostasis
      1. Conditions for homeostasis
         1. Temperature
         2. Water content
         3. Carbon dioxide
         4. Blood sugar
      2. Negative
      3. Positive
2. **Information Processing**
   1. The brain
      1. Regions of the brain
      2. Functions of the regions of the brain
   2. Animal behavior
   3. Integration of functioning of the brain, processing, interpretation, response
3. **Organization of Matter and Energy Flow in Organisms**
   1. Photosynthesis
      1. Reaction
      2. Formation of sugars and other organic compounds
      3. Uses in cells
   2. Recombination of chemical elements in living systems
      1. Anabolism/catabolism
      2. Nitrogen-fixing
      3. Decomposition
      4. Water cycle
   3. Energy transfer in ecosystems
      1. Cellular respiration
      2. Aerobic/anaerobic respiration
      3. Cellular respiration and body temperature maintenance
      4. Conservation of matter and energy in ecosystems
4. **Cycles of Matter and Energy Transfer in Ecosystems**
   1. Photosynthesis and Cellular Respiration provide most of the energy for life processes
   2. Food Web/Food Pyramid, efficiency and numbers rule-(10% rule)
   3. Chemical elements in the biomass in food chains are recycled, recombined and conserved
      1. Matter reacts to release energy
      2. Matter can be conserved or stored
      3. Matter can be discarded
   4. Competition among organisms is for matter and energy
   5. The carbon cycle
5. **Interdependent Relationships in Ecosystems**
   1. Ecosystems have carrying capacities
   2. Factors limit population growth-predation, competition, disease
6. **Ecosystem Dynamics, Functioning, and Resilience** 
   1. Interactions in a stable ecosystem will keep the numbers relatively constant
   2. A stable, resilient ecosystem can survive a modest ecological disturbance
   3. Extreme disturbances can disrupt the ecosystem
   4. Anthropogenic disturbances can threaten the survival of some species and ecosystems
      1. Habitat destruction
      2. Pollution
      3. Poaching/overexploitation
      4. Introduction of invasive species
      5. Climate change
7. **Social Interactions and Group Behavior**
   1. Animals including humans have a strong drive for social affiliation
   2. Bonds formed with parents and peers may increase likelihood of survival
   3. Individuals may suffer if reared in isolation
8. **Biodiversity and Humans**
   1. Biodiversity is increased through speciation
   2. Biodiversity is decreased through extinction which is irreversible
   3. Humans depend on natural/biological resources and their presence has an adverse impact on populations that can potentially cause extinctions.
   4. Sustaining biodiversity supports and enhances life on Earth.
9. **Growth and Development of Organisms**
   1. Mitosis
   2. Differentiation of cells determined by genes and environmental factors
   3. Meiosis
10. **Inheritance of Traits**
    1. In all organisms, genetic material is carried in the chromosomes
    2. Each chromosome is made of a long DNA molecule and the gene are locations on the chromosome
    3. Genes code for proteins/traits
       1. All cells have same genetic content but are expressed in different ways
       2. Not all genes code for a protein, some are regulatory and some unknown
11. **Variation of Traits**
    1. Information passed down from parents to offspring is coded for by DNA in the chromosomes
    2. During meiosis, chromosomes can swap sections leading to more variation
    3. Errors in DNA replication are called mutations and can lead to more variation in a population.
    4. Environmental factors can cause mutations
    5. Variation and distribution of traits depends on genetics and environment
12. **Evidence of Common Ancestry and Diversity**
    1. Genetic information provides evidence for evolution
       1. DNA sequences overlap among species
       2. Multiple lines of descent can be inferred by comparing DNA
    2. Other evidence
       1. Anatomical evidence
       2. Amino acid sequences
       3. Embryological evidence
13. **Natural Selection**
    1. Conditions
       1. Variation in the genetic information
       2. Variation in the expression of genetic information
    2. Traits that increase fitness (survival and ability to reproduce) become more common in the population
14. **Adaptation** 
    1. Natural selection is caused by 4 factors
       1. Potential for species growth in number
       2. Genetic variation in a population due to mutation and sexual reproduction
       3. Competition for an environment’s limited supply of the resources that individuals need in order to survive and reproduce
       4. Proliferation of organisms that are better able to survive and reproduce in that environment
    2. Natural selection leads to adaptation
       1. Anatomical
       2. Behavioral
       3. Physiological
    3. Advantageous heritable traits lead to an increase in the proportion of individuals with that trait and a decrease of those without
    4. Distribution of traits can change when conditions change
       1. Changes in the physical environment have contributed to the expansion and emergence of some species and the extinction of others
       2. Species become extinct because they can no longer survive and reproduce in an altered environment.
       3. If change is too fast or drastic, the opportunity for evolution is lost
15. **Weather and Climate**
    1. Foundation for Earth’s climate is the electromagnetic radiation from the sun, its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems and space.
    2. Climate change can occur when these systems are altered.
    3. Geological record shows that changes to global and regional climate can be caused by
       1. Earth’s orbit
       2. Tectonic events
       3. Ocean circulation
       4. Volcanic activity
       5. Glaciers
       6. Vegetation
       7. Human activities
    4. These processes can be sudden or long-term
    5. Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate
    6. Global climate models are used to understand past changes
    7. Current models predict that temperatures will continue to rise, but this depends on human generated greenhouse gases.
16. **Global Climate Change**
    1. The magnitude of human impacts are greater than before as well as the ability to predict and manage future impacts
    2. Science and engineering will be critical to understanding the possible impacts of global climate change.
17. **Natural Resources**
    1. Resource availability has guided human society and affects geopolitical relationships and can limit development.
    2. All forms of energy production and other resource extraction have economic, social, environmental, and political costs, risks, and benefits.
    3. New technology and regulations change the balance of these factors
    4. As the human population increases, the demand for a higher quality of living increases and resources become scarcer.
18. **Natural Hazards**
    1. Natural hazards have shaped the course of human history.
    2. They can be local, regional or global
    3. Human activities can contribute to the frequency and intensity of some natural hazards
19. **Human Impacts on Earth Systems**
    1. Sustainability of human societies and the biodiversity that supports them requires responsible management
    2. Scientist and engineers can make major contributions to decreasing pollution and waste
    3. Computer simulations and other studies and important discoveries are still being made about human activities and changes.