

12<sup>th</sup> Grade  
Advanced Biology

Life Science

The Cell

- Most cell functions involve chemical reactions.
- Cell functions are regulated.
- Cells have particular structures that underlie their functions.
- Cells store and use information to guide their functions.
- Plant cells contain chloroplasts, the site of photosynthesis.
- Cells can differentiate. Complex multicellular organisms are formed from highly organized arrangements of differentiated cells.

Molecular Basis of Heredity

- In all organisms, the instructions for specifying the characteristics of the organism are carried in DNA.
- Most of the cells in a human contain two copies of each of 22 different chromosomes. One additional pair determines whether the individual will be male or female.
- Changes in DNA occur spontaneously at low rates.

Biological Evolution

- Species evolve over time.
- Biological classifications are based on how organisms are related.
- The great diversity of organisms is the result of more than 3.5 billion years of evolution that has filled every available niche with life-forms.

Interdependence of Organisms

- The atoms and molecules on the Earth cycle among the living and nonliving components of the biosphere.
- Organisms both cooperate and compete in ecosystems.

Matter, Energy, and Organization of Living Systems

- The chemical bonds of food molecules contain energy.
- The complexity and organization within an organism result from the organism's need to obtain, transform, transport, release, and eliminate the matter and energy required to sustain the organism.
- The energy for life primarily derives from the sun.
- The distribution and abundance of organisms and populations in ecosystems are limited by the availability of matter and energy and the ability of the ecosystem to recycle materials.
- Living systems require a continuous input of energy to maintain their chemical and physical organizations.

Behavior of Organisms

- Multicellular animals have nervous systems that generate behavior.
- Organisms have behavioral responses to internal changes and to external stimuli. Responses to external stimuli can result from interactions with our own species and others and with environmental changes. Behavior must be flexible enough to deal with uncertainty and change.
- Behavioral biology has implications for humans because it provides links to psychology, sociology, and anthropology.

Unifying Concepts

- Systems, order, and organization
- Change, constancy, and measurement
- Form and function

Physical Science

- Structure and properties of matter
- Chemical reactions
- Interactions of energy and matter

Science in Personal and Social Perspectives

- Natural resources
- Environmental quality
- Science and technology in local and global challenges

Science as Inquiry

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

Science and Technology

- Abilities of technological design
- Understandings about science and technology

Earth and Space Science

- Energy in the Earth system
- Geochemical cycles

History and Nature of Science

- Science as a human endeavor
- Nature of scientific knowledge
- Historical perspectives