

EXPLANATION OF THE MAJOR THEMES

The AP Biology Development Committee has identified eight major themes that recur throughout the course (see page 5). AP Biology teachers should emphasize the pervasiveness of the themes to assist students in organizing concepts and topics into a coherent conceptual framework.

- I. **Science as a Process**—Science is a way of knowing. It can involve a discovery process using inductive reasoning, or it can be a process of hypothesis testing.
Example: The theory of evolution was developed based on observation and experimentation.
- II. **Evolution**—Evolution is the biological change of organisms that occurs over time and is driven by the process of natural selection. Evolution accounts for the diversity of life on Earth.
Example: Widespread use of antibiotics has selected for antibiotic resistance in disease-causing bacteria.
- III. **Energy Transfer**—Energy is the capacity to do work. All living organisms are active (living) because of their abilities to link energy reactions to the biochemical reactions that take place within their cells.
Example: The energy of sunlight, along with carbon dioxide and water, allows plant cells to make organic materials, synthesize chemical energy molecules, and ultimately release oxygen to the environment.
- IV. **Continuity and Change**—All species tend to maintain themselves from generation to generation using the same genetic code. However, there are genetic mechanisms that lead to change over time, or evolution.
Example: Mitosis consistently replicates cells in an organism; meiosis (and hence sexual reproduction) results in genetic variability.
- V. **Relationship of Structure to Function**—The structural levels from molecules to organisms ensure successful functioning in all living organisms and living systems.
Example: Aerodynamics of a bird's wing permits flight.
- VI. **Regulation**—Everything from cells to organisms to ecosystems is in a state of dynamic balance that must be controlled by positive or negative feedback mechanisms.
Example: Body temperature is regulated by the brain via feedback mechanisms.
- VII. **Interdependence in Nature**—Living organisms rarely exist alone in nature.
Example: Microscopic organisms can live in a symbiotic relationship in the intestinal tract of another organism; the host provides shelter and nutrients, and the microorganisms digest the food.
- VIII. **Science, Technology, and Society**—Scientific research often leads to technological advances that can have positive and/or negative impacts upon society as a whole.
Example: Biotechnology has allowed the development of genetically modified plants.