Matter and Energy Transformations

What the reviewers found in *Biology: Visualizing Life* (Holt, Rinehart and Winston, 1998)

The chemical elements [nitrogen and carbon] that make up the molecules of living things pass repeatedly through food webs and the environment, and are combined and recombined in different ways.

- **a1** Plants make sugar molecules from carbon dioxide (in the air) and water.
- **a2** Plants transfer the energy from light into “energy-rich” sugar molecules.
- **b1** Plants break down the sugar molecules that they have synthesized into carbon dioxide and water, use them as building materials, or store them for later use.
- **b2** Plants get energy to grow and function by oxidizing the sugar molecules. Some of the energy is released as heat.
- **c1** Other organisms break down the stored sugars or the bodily structures of the plants (food) they eat (or animals they eat) into simpler substances, reassemble them into their own body structures, including some energy stores (as glycogen).
- **c2** Other organisms break down the consumed body structures of the plants they eat (or animals they eat) into simpler substances, reassemble them into their own body structures, including some energy stores (as glycogen).

Within cells are specialized parts for the capture and release of energy.

**Arrangements of atoms have chemical energy.**

Food provides the molecules that serve as fuel and building materials for all [human] organisms.

**Carbon and hydrogen are common elements of living matter.**

An especially important kind of reaction between substances involves combination of oxygen with something else—as in burning or rusting.

As in physical systems, energy can only change from one form into another.

No matter how substances within a closed system interact with one another, or how they combine or break apart, the total mass of the system remains the same. The idea of atoms explains the conservation of matter: If the number of atoms stays the same no matter how they are rearranged, then their total mass stays the same.

Most of what goes on in the universe ... involves some form of energy being transformed into another. Energy in the form of heat is almost always one of the products of an energy transformation.

Different amounts of energy are associated with different configurations of atoms and molecules. Some changes of configuration require an input of energy whereas others release energy.

- **d1** The chief elements that make up the molecules of living things pass repeatedly through food webs and the environment, and are combined and recombined in different ways.
- **d2** As each link in a food web, some energy is stored in newly made structures but much is dissipated into the environment as heat. Continual input of energy from sunlight keeps the process going.

**Key**

- **Text Color**
  - Black: Key Idea Treated
  - Gray: Key Idea Not Treated
  - Blue: Related Idea Treated
  - Light Blue: Related Idea Not Treated
  - Pink: Prerequisite Idea Treated
  - Pink: Prerequisite Idea Not Treated

- **Arrow Pattern**
  - -- -- -- Connection Treated
  - -- -- -- Connection Incompletely Treated
  - --- --- --- Connection Not Treated