

## Chapter 5

CREATION'S LIFE SUPPORT SYSTEM

**OVERVIEW:** In order to understand the complex relationships that sustain life on Earth, biologists (specifically, ecologists) have attempted to construct small scale models sometimes called microcosms. Joseph Priestley was one of the first to show relationships between an autotroph and a heterotroph in a confined space. More recently, in the 1990's, a larger scale system, called Biosphere II was constructed. We can learn much from comparing such simple ecosystems with the biosphere of Earth. Here, we consider how autotrophs and heterotrophs 'tap into' the energy from the Sun and utilize it to sustain life on Earth?"

**STRATEGY:** Chapter 5, pages 77-89 introduce us to the creation's life support system. Skim the headings and then, read carefully. Seek to relate the content to your experience as one who is a living, breathing user of energy as it flows through Earth's biosphere.

**VOCABULARY:** Define each of the following in your own words:

ecosystem	food chain	detritivores
biotic community	autotrophs	decomposers
potential energy	heterotrophs	photosynthesis
kinetic energy	consumers	respiration
thermodynamic laws	herbivores	primary productivity
	carnivores	

**LEARNING GOALS:** You can measure your mastery of this assignment by completing the following:

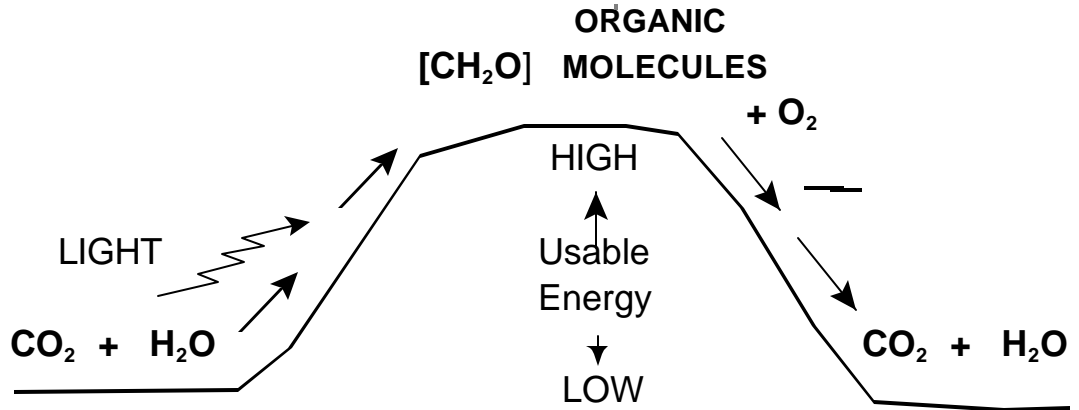
1. Group the biological terms above according to their closeness of relationship. For example, food chain can serve as a major heading under which one can arrange autotroph and heterotroph. What terms can be arranged under heterotroph? You may be familiar with "concept mapping," explained in Appendix C of your text, which uses this approach. Note: It is helpful to review our earlier discussion of "ecological classification" in Assignment #3.
2. List the requirements for sustaining the life of an autotroph (*e.g.* a bean plant)? For a heterotroph such as yourself?
3. No doubt you have read about the Biosphere II project in the Arizona desert (See "BIO 100 Web Links" Page, and click on 'Biosphere II Web Site' under Assignment #5). This site provides information on the large glass enclosure intended to simulate the "Biosphere I" of planet Earth. What considerations would you raise before agreeing to enter Biosphere II to be sealed off from Biosphere I for a long period. Relate to text Section 5-D. *Alternatively:* How could you design a fish aquarium to operate without an air pump?

**LECTURE EMPHASIS** will be upon the following topics:

1. Introduction of *ecology*, a subdiscipline of *biology* that studies *ecosystems*
2. Ecosystems: Illustrated by Priestley's Jar, and Biosphere II
3. Priestley's Jar:
  - a. How do combustion and animal life fare in a closed atmosphere?
  - b. Mouse and mint in confinement – basis for classifying autotrophs and heterotrophs?
  - c. Challenges to sustaining life in a closed system

# COMPARING PHOTOSYNTHESIS and RESPIRATION

WHEN OCCUR ?	IN LIGHT	·	LIGHT and DARK
WHERE OCCUR?	AUTOTROPHS	·	ALL LIVING CELLS
CHEMICAL CHANGE:		·	



ENERGY CONVERSION      SOLAR ENERGY → CHEMICAL ENERGY → CELLULAR ENERGY REQUIREMENTS

ANALOGY:	EARNING PAYCHECK	·	CASHING PAYCHECK
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