A View of Life

Lecture Outline

I. Life can be defined in terms of the characteristics of living organisms
   A. Organisms are composed of cells
      1. Unicellular organisms are composed of a single cell
      2. Multicellular organisms are composed of several or great numbers of cells
      3. The cell theory was first described by Schleiden and Schwann in the 1800s
   B. Living organisms grow and develop
      1. Growth may result from increase in the number of cells or individual cell size
      2. Development is the process of change during the life span of the organism
   C. Metabolism includes the chemical processes essential to growth, repair, and reproduction
      1. The relatively constant internal environment is known as homeostasis
   D. Movement is a basic property of cells
      1. Movement may result from amoeboid motion, cilia or flagella
      2. Muscular systems allow movement
      3. Some organisms are sessile
   E. Organisms respond to stimuli
      1. Responses of animals are more obvious
      2. Plants respond to light, gravity, water, touch, and other stimuli
   F. Organisms reproduce
      1. Life comes from life
      2. Asexual reproduction does not include gamete fusion
      3. Most plants and animals reproduce sexually
   G. Populations evolve and become adapted to the environment
      1. Adaptations may be structural, physiological, and/or behavioral

II. Information must be transmitted within individuals and between individuals
   A. DNA transmits information from one generation to the next
      1. Deoxyribonucleic acid composes the genes, which are the hereditary material
   B. Information is transmitted by many types of molecules and by nervous systems
      1. Hormones and neurotransmitters transmit information

III. Evolution is the primary unifying concept of biology
   A. Species adapt in response to changes in the environment
   B. Natural selection is an important mechanism by which evolution proceeds
      1. Charles Darwin and Alfred Wallace first proposed natural selection as the mechanism of evolution
C. Populations evolve as a result of selective pressures from changes in the environment

D. Biological organization reflects the course of evolution
   1. Organisms have several levels of organization
      a. The chemical level is the most basic level of organization
      b. The cellular level includes the organelles and membranes of a cell
      c. Tissues are composed of similar cells
      d. Organs are composed of tissues
      e. Organ systems are coordinated organs and tissues
   2. Several levels of ecological organization can be identified
      a. Populations are the interacting members of the same species found in a given area at the same time
      b. Communities are all of the populations of organisms found in a given area at the same time
      c. The community and the abiotic environment is the ecosystem
      d. Ecology is the study of ecosystems

E. Millions of kinds of organisms have evolved on our planet
   1. Biologists use a binomial system for classifying organisms
      a. Linnaeus developed the system of classification used today
      b. Binomial nomenclature describes the genus and species of the organism
   2. Taxonomic classification is hierarchical
      a. Kingdoms are broken down into phyla, classes, orders, families, genera, and species
   3. Most biologists recognize six kingdoms
      a. Early biologists recognized the plant and animal kingdoms
         1). Some biologists split the bacteria into 2 separate kingdoms
      b. Kingdom Archaeabacteria are a unique group of organisms which biologists recently have split off from the bacterial kingdom
      c. Kingdom Eubacteria consists of the bacteria
      d. Kingdom Protista consists of the protozoans and algae
      e. Kingdom Fungi contains the mushrooms, molds, and yeasts
      f. The animals belong to kingdom Animalia
      g. Plants belong to kingdom Plantae

IV. Life depends on a continuous input of energy from the sun
   A. Energy flows through individual cells and organisms
      1. Cellular respiration produces energy for most cells
   B. Energy flows through ecosystems
      1. Energy flows from producers to consumers and decomposers
      2. Producers manufacture their own food
         a. Producers (autotrophs) are typically photosynthetic
      3. Consumers obtain energy by eating producers
         a. Consumers (heterotrophs) depend on the producers
      4. Decomposers obtain energy from wastes and dead organisms
         a. Important decomposers include bacteria and fungi
V. Biology is studied using the scientific method
   A. Science is based on systematic thought processes
      1. Science includes both deductive and inductive reasoning
   B. Scientists make careful observations and recognize problems
   C. A hypothesis is a proposed explanation which is testable
   D. A prediction is a logical consequence of a hypothesis
   E. Predictions can be tested by experimentation
      1. Scientific experiments include an experimental and control group
      2. Placebos and “double-blind” experiments are part of much experimentation in the medical field
   F. Scientists draw conclusions from the results of experiments
      1. Sampling error may lead to inaccurate conclusions
   G. A well-supported hypothesis may lead to a theory
      1. A theory which is nearly universally accepted is a principle
      2. Laws are principles of the greatest importance
   H. Science has ethical dimensions