What is Biology?

Unifying themes in Biology:

1. A hierarchy of organization
2. Emergent properties
3. Cellular basis of life
4. Heritable information (biological information)
5. Interaction of organisms with their environment
6. Unity in diversity
7. Evolution: The core theme of Biology

1. A HIERARCHY OF ORGANIZATION
   - Biological organization is based on structural levels.

   ![Hierarchy Diagram]

   Organization beyond the level of the organism:

   Population
   Community
   Ecosystem
   Biosphere

2. Emergent Properties
ATTRIBUTES OF LIFE:

a. Order

b. Reproduction
   Biogenesis:

c. Growth and Development

d. Energy Utilization

e. Performs chemical reactions:
   Metabolism:
      Anabolism:
      Catabolism:

f. Response to environment:
   Homeostasis:
      a) Negative Feedback

      b) Positive Feedback

g. Evolutionary Adaptations

3. THE CELLULAR BASIS OF LIFE
   1) 
   2) 
   3) 
   4) 
   5) 
   • Two major cell types:
      1. Prokaryotic
2. Eukaryotic

4. HERITABLE INFORMATION

5. THE INTERACTION OF ORGANISMS WITH THEIR ENVIRONMENT

6. UNITY IN DIVERSITY
   Estimated:
   
   1.5 million species identified, of which:
   - 260,000 plant species
   - 50,000 vertebrates
   - 750,000 insects

   Taxonomy:
   Taxonomic categories are ranked into a hierarchy form most to least inclusive.

   General
   DOMAIN Eukarya
   KINGDOM Animalia
   PHYLUM Chordata
   CLASS Mammalia
   ORDER Carnivora
   FAMILY Canidae
   GENUS Canis
   SPECIES C. latrans
   | Specific                        |
   |                               |
   |                               |

   Classical 5 Kingdoms scheme
   Monera =>
   Protista =>
   Fungi =>
   Plantae =>
   Animalia =>

   3 Domains => Archaea, Bacteria and Eukarya.
   6 Kingdoms => Monera split into: Archaea
                                              Bacteria

7. EVOLUTION: THE CORE THEME OF BIOLOGY
   Life evolves and species change over time - "A change in the genes (DNA sequence)"
   All life is connected and can be traced back 3.5 million years.

   Charles Darwin = The Origin of Species
a) Descent with modification

   **Similarities** between species:

   **Differences** between species:

b) Natural selection and differential reproduction