Classification of Living Matter

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Energy

Physics: the study of energy and its interaction with matter. Energy is the ability to do work or cause change.

Matter

Chemistry: the study of matter and its properties and composition. Matter occupies space and has mass.

Living Matter

Biology: the study of the interaction of matter and energy in living organisms and systems.

Hierarchy of Living Matter

Energy-Matter Interactions

Cell Level

- **Atoms**: basic building blocks of all living matter.
- **Molecules**: groups of atoms - smallest units of compounds used in chemical reactions in organisms.
- **Macromolecules**: groups of organic molecules - (carbohydrates, lipids, proteins, and nucleic acids).
- **Organelles**: units (cellular organs) that perform specialized functions within a cell.
- **Cells**: groups of organelles - the basic unit of all organisms - all organisms consist of one of more membrane-bound cells to carry out activities of life.

Organism Level

- **Tissues**: a structural-functional group of cells.
- **Organs**: a structural-functional group of tissues.
- **Organ Systems**: a structural-functional group of organs.
- **Organisms**: living structural-functional units that have an organized structure, reproduce, grow, adapt, respond to stimuli, and maintain homeostasis.

Population Level

- **Populations**: groups of organisms in the same species and living in the same place. Domains of life include: Bacteria, Archaea, and Eukaryota.

Example: Human (*Homo sapiens*) Classifications:

Domain: Eukaryota
Kingdom: Animalia
Phylum: Chordata
Class: Mammalia
Order: Primates
Family: Hominidae
Genus: Homo
Species: sapiens. Similar in physical appearance and able to interbreed.

- **Communities**: all populations of different species living in the same place.
- **Ecosystems**: a biological community and the physical habitat in which the community lives.
- **Biomes**: major regions of the world with similar climate, animals, and plants.
- **Biosphere**: the global ecosystem that consists of all living organisms and the nonliving components that living organisms derive their energy and matter (nutrients).

The organization and evolution of biological systems are determined by the principles and processes of physics and chemistry. All levels of living matter are governed by energy and matter interactions – use energy to perform work. Living organisms are self-organizing information and energy processing systems that use energy-matter interactions to maintain life.