A Brief Introduction to the Levels of Organization of Living Things

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The scientific study of the different levels of organization of living things helps us understand their structure and function. Every organism on Earth, from the smallest to the largest one, follows this organizational order. This topic is important because it helps us understand that every living thing is significant. Environmentalists figure out ways to preserve an ecosystem through knowledge of these levels of organization.

There are 13 levels of organization. In sequence, they are represented as atoms, molecules, organelles, cells, tissues, organs, organ systems, organisms, population, community, ecosystem, biome, and biosphere.

Atom: It is the most basic and fundamental unit of matter. It consists of a positively charged nucleus that is made up of protons and neutrons, and revolving around them are the negatively charged electrons. An atom that consists of an equal number of protons and electrons is neutral and stable.

Molecule: The formation of chemical bonds between two or more atoms leads to the formation of a molecule. It is one of the most basic parts of matter. Biomolecules (life-molecules) are those necessary for life.

Organelle: It is a part of a cell and is made up of a group of biomolecules. Organelles take part in the chemical reactions and interactions in the cellular processes of an organism. Organelles in eukaryotic cells (cells that do not have a defined nucleus) are different from those in prokaryotic ones (cells that have a defined nucleus). A few examples include nucleus and chloroplasts (plant cells), and golgi bodies and mitochondria (animal cells).

Cell: It is considered the basic unit and building block of life. It is bound by a cell membrane, and may have a nucleus which acts as its brain. Cytoplasm surrounds the nucleus, which contains cell organelles like mitochondria, vacuole, and chloroplasts. Basically, they are of 2 types; prokaryotic and eukaryotic. Prokaryotic cells have a smaller size and simpler form, and lack a nucleus. Eukaryotic cells are more specialized in structure than the prokaryotic ones. Moreover, they are larger in size (by almost 15 times).

Tissue: Tissues are a group of cells that work together to perform a specific job in the body. They are made of only one type of cell. There are four main animal tissues including: epithelial, connective, nervous and muscular. Epithelial cells, or skin cells, cover the body and line the organs. Connective tissue does just that; it connects the body together and includes blood, bones, cartilage and fat. The brain and nerves are made up of nervous tissue. Muscular tissue supports, protects and allows movement to happen within the organism. Epidermis, transportation and root tissues are the three major tissues found in plants. The epidermis makes up the leaves and stem covering, the transportation tissue carries water and nutrients around the plant and the root tissue stores food and supports the plant.

Organ: Two or more tissues working together to do a specific job for the organism is an organ. The major organs of animals include lungs, brain, liver, etc., whereas roots, stem, and leaves are the different organs of plants. Organs can be classified on the basis of the functions they perform. For example, in case of animals, the tongue, ears, eyes, skin, and nose are sensory organs. Flowers and seeds are the reproductive parts of plants.

Organ System: Groups of organs working together to perform certain functions form organ systems. Examples are the circulatory system in animals, and the vascular system in plants. The organs in an organ system are interdependent, i.e., they work in harmony to carry out various body functions. For example, the digestive system that carries out the process of digestion consists of salivary glands, stomach, esophagus, gallbladder, liver, intestines, pancreas, rectum, and anus.

Organism: An organism can be defined as the fully functional living being that can survive in a particular environment. It can be either unicellular or multicellular.

These are the basic levels of organization of living things. However, in addition to the above, there are others like population, community, ecosystem, biome, and biosphere. It is necessary to understand that the higher we go in organization, the more difficult it is to clearly explain the level.

Population: It is the term used to show a group of organisms which belong to the same species. They share food and space and reproduce among themselves. The population of a particular species indicates a close interaction between its organisms.

Community: Two or more populations together make up a community. There are various ways like competition, parasitism, predation, commensalism, and mutualism, by which populations belonging to different species interact with each other.

Ecosystem: As we move up on this ladder of organization, the complexity tends to increase. The term ecosystem is defined as an area or environment where one or more communities can thrive and flourish. However, this stage is not the same as community. In fact, it is a greater area that provides space for different communities. Thus, the populations of many species can together thrive in a particular ecosystem like a desert, grassland, rainforest, etc.

Biome: This level is similar to an ecosystem. The definition of this stage is made in terms of the conditions (and not just space) that are suited to a group of communities (plants, animals, microbes, etc.). Classification of this level is carried out because certain conditions must be present for organisms to survive. The structure of plants is an important criterion used for classifying biomes. It divides the plants into groups like shrubs, trees, grasses, etc.

Biosphere: It is simply defined as the place where all the life on Earth exists. The hydrosphere, lithosphere, and atmosphere, along with all the above-mentioned levels, together make up the biosphere. It shows all the life forms on Earth, from the microscopic viruses, bacteria, algae, etc., to the largest animals like blue whales and elephants.

The above levels show us the organization of living things. We will focus our studies from molecules to organisms and become introduced to how each of these levels support life on our planet.