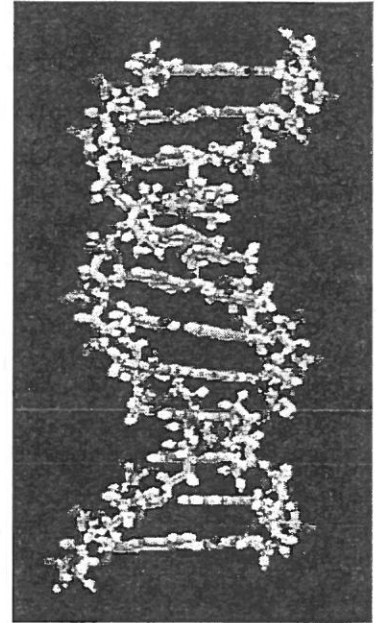


Reading: Levels of Organization of Living Things

Living things are highly organized and structured, following a hierarchy that can be examined on a scale from small to large. The **atom** is the smallest and most fundamental unit of matter. It consists of a nucleus surrounded by electrons. Atoms form molecules. A **molecule** is a chemical structure consisting of at least two atoms held together by one or more chemical bonds. Many molecules that are biologically important are **macromolecules**, large molecules that are typically formed by polymerization (a polymer is a large molecule that is made by combining smaller units called monomers, which are simpler than macromolecules). An example of a macromolecule is deoxyribonucleic acid (DNA) (Figure 1), which contains the instructions for the structure and functioning of all living organisms.

Some cells contain aggregates of macromolecules surrounded by membranes; these are called **organelles**. Organelles are small structures that exist within cells. Examples of organelles include mitochondria and chloroplasts, which carry out indispensable functions: mitochondria produce energy to power the cell, while chloroplasts enable green plants to utilize the energy in sunlight to make sugars. All living things are made of cells; the **cell** itself is the smallest fundamental unit of structure and function in living organisms. (This requirement is why viruses are not considered living: they are not made of cells. To make new viruses, they have to invade and hijack the reproductive mechanism of a living cell; only then can they obtain the materials they need to reproduce.) Some organisms consist of a single cell and others are multicellular. Cells are classified as prokaryotic or eukaryotic. **Prokaryotes** are single-celled or colonial organisms that do not have membrane-bound nuclei or organelles; in contrast, the cells of **eukaryotes** do have membrane-bound organelles and a membrane-bound nucleus.



In larger organisms, cells combine to make **tissues**, which are groups of similar cells carrying out similar or related functions. **Organs** are collections of tissues grouped together performing a common function. Organs are present not only in animals but also in plants. An **organ system** is a higher level of organization that consists of functionally related organs. Mammals have many organ systems. For instance, the circulatory system transports blood through the body and to and from the lungs; it includes organs such as the heart and blood vessels. **Organisms** are individual living entities. For example, each tree in a forest is an organism. Single-celled prokaryotes and single-celled eukaryotes are also considered organisms and are typically referred to as microorganisms.

All the individuals of a species living within a specific area are collectively called a **population**. For example, a forest may include many pine trees. All of these pine trees represent the population of pine trees in this forest. Different populations may live in the same specific area. For example, the forest with the pine trees includes populations of flowering plants and also insects and microbial populations. A **community** is the sum of populations inhabiting a particular area. For instance, all of the trees, flowers, insects, and other populations in a forest form the forest's community. The forest itself is an ecosystem. An **ecosystem** consists of all the living things in a particular area together with the abiotic, non-living parts of that environment such as nitrogen in the soil or rain water. At the highest level of organization (Figure 2), the **biosphere** is the collection of all ecosystems, and it represents the zones of life on earth. It includes land, water, and even the atmosphere to a certain extent.

Fill In the table below with a brief description and example of each level of organization.

Level of Organization	Description	Example
Atom	smallest unit of matter nucleus surrounded by e ⁻	Hydrogen
Molecule	2+ atoms held together by chemical bonds	H ₂ O
Macromolecule	large molecules formed	DNA, protein carbs.
Organelle	groups of macromolecules surrounded by membranes that perform a function.	mitochondria chloroplast
Cell	smallest unit of structure and function (life)	prokaryotic eukaryotic
Tissue	groups of similar cells carrying out similar functions	muscle tissue
Organ	collections of tissues grouped together to achieve a common function	heart
Organ System	related organs	circulatory system
Organism	sum of organ systems, living entity	person
Population	All individuals of a species living in an area	people in Bettendorf
Community	sum of populations in an area	People, Dogs, cats in Bettendorf
Ecosystem	All the living + non-living things in an area	People, Dogs, cats, water, & air in Bettendorf
Biosphere	Collection of all ecosystems	World.

Questions: Using the passage provided, answer the following questions regarding levels of organization.

1. Which of the following statements is false?

- Tissues exist within organs, which exist within organ systems.
- Communities exist within populations, which exist within ecosystems.
- Organelles exist within cells, which exist within tissues.
- Communities exist within ecosystems, which exist in the biosphere.

2. Circle which of the following is broader than both of the following categories: species and communities.

- Organism, Population, Ecosystem