

I'm not robot!

Living organisms are made up of four levels of organization: cells, tissues, organs, and organ systems. Learning ObjectivesOrder the levels of organization for living organisms Key Points Cells are the most basic unit of life at the smallest level of organization. Cells can be prokaryotic (without nucleus) or eukaryotic (with nucleus). The four categories of tissues are connective, muscles, epithelial, and nervous tissues. Organs are made of different types of tissues and perform complex functions. They can be hollow or solid. Organ systems are groups of organs that perform similar functions or perform functions together. Many physiological functions are carried out by multiple organ systems working in tandem. Key Terms cell: The smallest unit of life capable of independent reproduction. Generally contains nucleic acid, cytoplasm, a cell membrane, and many other proteins and structures. organ: A structure made of different tissues that work together to perform physiological functions. organ system: A group of organs and tissues that work together to perform specific functions. Tissues: A group of similar cells with the same origin that work together to perform the same function. Using the circulatory system as an example, a cell in this system is a red blood cell, the heart's cardiac muscle is a tissue, an organ is the heart itself, and the organ system is the circulatory system. An organism is made up of four levels of organization: cells, tissues, organs, and organ systems. These levels reduce complex anatomical structures into groups; this organization makes the components easier to understand. The first and most basic level of organization is the cellular level. A cell is the basic unit of life and the smallest unit capable of reproduction. While cells vary greatly in their structure and function based on the type of organism, all cells have a few things in common. Cells are made up of organic molecules, contain nucleic acids (such as DNA and RNA), are filled with fluid called cytoplasm, and have a membrane made out of lipids. Cells also contain many structures within the cytoplasm called organelles, which perform various cellular functions. Cells may be prokaryotic (without a nucleus) in bacteria and archaea (single-celled organisms), or eukaryotic (with nucleus-enclosing DNA) in plants, animals, protists, and fungi. In humans, most cells combine to form tissues, but some cells are found independent of solid tissues and have their own functions. A red blood cell found circulating in the bloodstream carrying oxygen throughout the human body is an example of an independent cell. Tissues are a group of similar cells of the same origin that carry out a specific function together. Humans have four different types of basic tissues. Connective tissues such as bone tissue are made up of fibrous cells and give shape and structure to organs. Muscle tissue is made up of cells that can contract together and allow animals to move. Epithelial tissues make up the outer layers of organs, such as the skin or the outer layer of the stomach. Nervous tissue is made of specialized cells that transmit information through electrochemical impulses, such as the tissue of nerves, the spinal cord, and the brain. An organ is a structure made up of different tissues that perform specific bodily functions. Most organs contain tissues such as parenchyma (used to perform the organ functions), stroma (connective tissue specific to organs) and epithelial. Organs may be solid or hollow, and vary considerably in size and complexity. The heart, lungs, and brain are all examples of organs. An organ system is a collection of organs that that work together to perform a similar function. There are eleven different organ systems in the human body, each with its own specific functions. One example is digestive system, which is made up of many organs that work together to digest and absorb nutrients from food. While most organ systems control a few specific physiological processes, some processes are more complex and require multiple organ systems to work together. For example, blood pressure is controlled by a combination of the renal system (kidneys), the circulatory system, and the nervous system. Levels of Organization in Animals: An organism contains organ systems made up of organs that consist of tissues, which are in turn made up of cells. LICENSES AND ATTRIBUTIONS CC LICENSED CONTENT, SHARED PREVIOUSLY Curation and Revision. Authored by: Boundless.com. Provided by: Boundless.com. License: CC BY-SA: Attribution-ShareAlike CC LICENSED CONTENT, SPECIFIC ATTRIBUTION Learning Objectives Describe the biological levels of organization from the smallest to highest level 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 which are chemical structures 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), which contains the instructions for the structure and functioning of all living organisms. Figure 1(1): DNA: All molecules, including this DNA molecule, are composed of atoms. Macromolecules can form aggregates within a cell that are surrounded by membranes; these are called organelles. Organelles are small structures that exist within cells. Examples of these 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, and 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; 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. Furthermore, 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, 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. Taken together, all of these levels comprise the biological levels of organization, which range from organelles to the biosphere. Figure 1(1): Biological Levels of Organization: The biological levels of organization of living things follow a hierarchy, such as the one shown. From a single organelle to the entire biosphere, living organisms are part of a highly structured hierarchy. The atom is the smallest and most fundamental unit of matter. The bonding of at least two atoms or more form molecules. The simplest level of organization for living things is a single organelle, which is composed of aggregates of macromolecules. The highest level of organization for living things is the biosphere; it encompasses all other levels. The biological levels of organization of living things arranged from the simplest to most complex are: organelle, cells, tissues, organs, organ systems, organisms, populations, communities, ecosystem, and biosphere. molecule: The smallest particle of a specific compound that retains the chemical properties of that compound; two or more atoms held together by chemical bonds. macromolecule: a very large molecule, especially used in reference to large biological polymers (e.g. nucleic acids and proteins) polymerization: The chemical process, normally with the aid of a catalyst, to form a polymer by bonding together multiple identical units (monomers).



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