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Period: _____ Date: _____





Structure Determines Function, and Levels of Biological Organization

Part 1: *Structure determines Function*

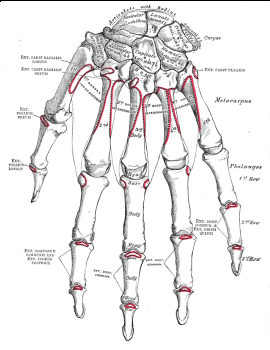
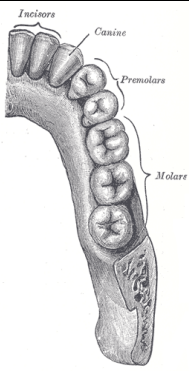
- *Structure* refers to something's *form, makeup or arrangement.*
- *Function* refers to something's *job, role, task, or responsibility.*
- *Determine* means to *cause, direct, govern.*

One of the key ideas of biology is that *structure determines function.* In other words, the way something is arranged or built enables it to play its role, fulfill its job, etc.




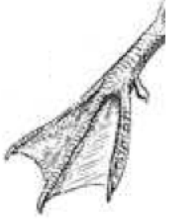
Structure determines function is also a key idea in engineering, where structure/function relationships are often easier to grasp. Look at the examples below:

Artifact (tool)	Structure/Function Relationship
 Hammer	The structure is related to the function because...
 Needle nosed pliers	The structure is related to the function because...
 Saw	The structure is related to the function because...
 Wrench	The structure is related to the function because...

Tools are fashioned by human designers. *Biological structures* come about as a species adapts to its environment. Adaptation comes about through evolution, which we'll study later in this course.. But for now, let's look at some biological adaptations.

 human hand	The structure is related to the function because the positioning of the digits (fingers and thumbs) enables you to exert fine control (such as when you grasp a pencil); or grab objects with force (such as when you grasp a stick).	 Human teeth	The structure is related to the function because the incisors (the teeth in front) can tear food; while the molars (the flat teeth in back) can grind food into tiny pieces.
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Application task 1:

 <p>bat wings</p>	<p>The structure is related to the function because...</p>
 <p>bat ears</p>	<p>The structure is related to the function because...</p>
 <p>bird foot 1</p>	<p>The structure is related to the function because...</p>
 <p>bird foot 2</p>	<p>The structure is related to the function because...</p>

Application task 2: Use your imagination to think of three more examples of biological adaptations that show structure/function relationships. These can be from animals (including humans), plants, or any other organism. For each one, label the adaptation, draw a sketch, and describe the relationship.

<p>_____</p>	<p>The structure is related to the function because...</p>
<p>_____</p>	<p>The structure is related to the function because...</p>
<p>_____</p>	<p>The structure is related to the function because...</p>

Part 2: Levels of Biological Organization

The scope of what's studied in biology is very broad. Here are some examples.

- *Molecular biologists* study *molecules* such as DNA or proteins
- *Nephrologists* focus on the workings and diseases of one *organ*, the kidney.
- *Ecologists* study the interactions between the living things and non-living things in a specific area.

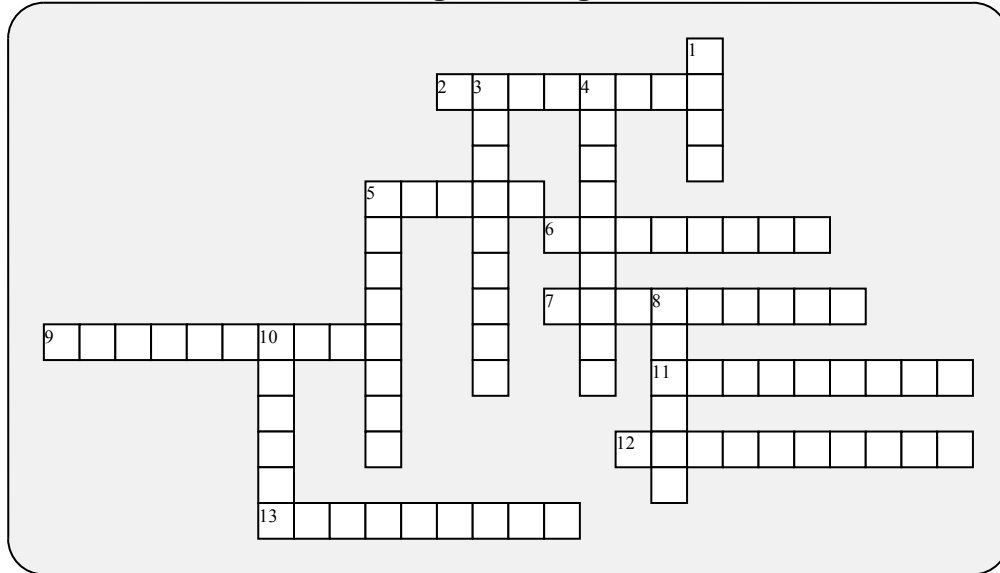
In between molecules, organs, and ecosystems, there are other levels as well. The table below describes these levels of biological organization, starting from the smallest level (molecules), and moving all the way to the entire planet.

Level	Definition/ explanation	Example
1. Molecule	A group of atoms that are chemically bonded together.	DNA
2. Organelle	A specialized part within a cell	the nucleus
3. Cell	The basic unit of life.	nerve cell
4. Tissue	A group of specialized cells that perform a similar function	muscle tissue
5. Organ	A group of tissues joined as a unit to perform a function	stomach
6. Organ system	A group of organs joined as a unit to perform a function	digestive system
7. Organism	A distinct living thing	a coyote
8. Population	A group of organisms of the same species, living in the same area.	Coyotes in Yosemite National Park
9. Community	The interacting, living populations, that live in the same area.	All the populations (plants, animals, fungi, bacteria) in Yosemite
10. Ecosystem	A community of living organisms, and their non-living parts of their environment (energy, soil, air)	The Yosemite community, plus its energy, soil, etc.
11. Biosphere	The zone of life on planet Earth. The sum of all of the ecosystems on Earth.	The Earth's biosphere (it's the only biosphere yet discovered)

Checking Understanding: Match the examples below with its level of biological organization.

Matching set 1	Matching set 2
1. A cell in a leaf doing photosynthesis: _____	1. A nerve cell: _____
2. A redwood tree: _____	2. A protein that lets nerve cells send impulses: _____
3. Chlorophyll: _____	3. A wolf: _____
4. Chloroplast: _____	4. All of the ecosystems on Planet earth
5. Leaf: _____	5. All of the wolves in Yellowstone: _____
6. Planet earth: _____	6. The brain, the nerves, and sensory organs (skin, eyes, ears): _____
7. Roots, stem, and veins in leaves the deliver water to leaf cells: _____	7. The brain: _____
8. The cells on top of a leaf that secrete wax to prevent water loss: _____	8. The nerve cells on the outer layer of the brain: _____
9. The community of organisms in redwood national park, plus the energy flowing into the park, the air, water, soil, etc. : _____	9. The nucleus of a nerve cell: _____
10. The redwood forest, including all the plants, animals, and other organisms. : _____	10. The wolves, all the other animals, the plants of Yellowstone Park. _____
11. The redwood trees in Redwood National Park: _____	11. The Yellowstone community, plus the energy, water, air, soil, etc. _____

Structure/Function; Levels of Biological Organization



Across:

- 2 - A group of atoms chemically bonded together
- 5 - A structure, made of several tissues, with a specific function (such as the heart or liver)
- 6 - Something's job, role, task
- 7 - The "living skin" of planet earth. All of the Earth's combined ecosystems
- 9 - A group of living things of the same species, living in the same area
- 11 - The arrangement, form, or makeup of something is its _____
- 12 - In biology, structure _____ function
- 13 - The living things in an area, plus the non-living things (energy, soil, water) in their environment

Down:

- 1 - The basic unit of life
- 3 - A part of a cell with a specific function
- 4 - All of the living things in one area
- 5 - A living thing
- 8 - A group of organs working together to perform a function makes up an organ _____
- 10 - A group of specialized cells working together to perform a specific function

Possible Answers:

biosphere, cell, community, determines, ecosystem, function, molecule, organ, organelle, organism, population, structure, system, tissue