Structure Fits Function

The theme of structure and function is an important concept in the study of biology. Biological systems have specific demands to preserve homeostasis and thereby sustain life. The specific structure of individual cells, tissues, organs, and organ systems allows for unique function and maintenance of organisms.

As you proceed through the following activity you will see many examples of the complementarity of structure and function in living things. Moving from the cellular to the organismic level you will find even more examples of such complementarity or correlation of structure and function.

This assignment is challenging to students because it requires
1. factual knowledge of the cell parts, tissues, organs, and organ systems,
2. conceptual understanding of the inner workings of living things, and lastly,
3. application of such concepts through the biological theme structure and function.

Instructions: The first few entries in the table below are examples of the theme "structure fits function" in cells. Read these carefully to see the way the function and structure are linked. The next entries ask you to make the connection between structure and function.
For each of the items, limit your answer to two sentences each.

Function	Structure
Example: DNA is replicated only a few pieces at time.	What DNA structure regulates the replication? *DNA has sections that signal for the beginning of a coding sequence as well as a DNA section that signals for the ending of a coding sequence. The possibility of damage to the DNA is minimized by having only small sections opened up at any time.*
Example: Hummingbirds often feed from flowers that do not have a place for them to perch.	How do hummingbirds access their food? *Hummingbirds can beat their wings fast enough to hover in midair and they have long bills and tongues which allow them to drink from the nectar of flowers.*
In vertebrate organisms, the nervous system must establish an effective system of communication.	What structure of nerve cells (neurons) allows for communication throughout the body?
Muscle tissue responds to electrical charges which causes them to contract, resulting in movement.	How does skeletal muscle respond to the nervous signals to result in movement?
Chlorophyll and other pigments needs	What organelle isolates these pigments?

isolation from the cytosol in order to perform its function.	
The cell membrane must be flexible enough for transport, but sturdy enough to withstand the impact of external factors.	What component of the cell membrane provides stability?
Hemoglobin is a globular protein that carries multiple oxygen molecules throughout the blood stream.	How does the structure of hemoglobin allow it to carry oxygen?
Proper cell function requires the ability to digest old organelles/metabolic wastes that take up space, waste valuable resources, and may be toxic to the cell.	What organelles perform this function and what specific toxin do they eliminate?
Most fungi do not have a system of transport for water and food.	As heterotrophic organisms, how do fungi “find” their food?
Some proteins are destined to stay in the cell while others are destined to leave the cell (secretion).	Are these two types of proteins produced in loose ribosomes? Explain.
ER, Golgi body and other membrane bound organelles often work together to produce a finished functional product.	What structure connects them?
Cellular respiration (specifically the electron transport chain) requires a very specific proton concentration in order to allow production of ATP.	What feature of the mitochondrion allows isolation of the proton gradient?
Amoeba is a unicellular protozoan that would not survive if it were to feed only by diffusion.	What type of cellular transport do they use for large molecules? What features of the cell membrane permit it?
Eukaryotic cells have a small surface area to volume ratio compared to prokaryotic cells.	What compensates for that?
The evolution of plants from aquatic environments to land resulted in adaptations for vertical growth and to store water.	How do land plants gain stability without the buoyancy of water to keep them upright?
Some cells depend on the ability to move in order to survive.	What do they use for such movement?