A Close Look Into Cells

1. What are cells? Cells are the smallest units that carry out all of the activities of life in organisms. All living organisms are made up of one or more cells. New cells only come from division of existing cells. Cells are similar to humans in that they feed, excrete, and absorb. Humans eat because they need energy. Cells, too, need an energy source. Humans can produce the nutrient Vitamin D from absorbing the Sun’s rays through the skin. This is similar to how cells allow certain ions through their membranes for nutrients. Some organisms are composed of a single cell, like bacteria or some algae. They can only be seen through the use of a microscope. Other organisms are composed of multiple cells, such as humans, animals, trees, and flowers.

2. A microscope is an instrument used by scientists to study cells and other microscopic organisms. It is similar to a magnifying glass. The first crude microscope was designed by a Dutch maker, Zacharias Janssen, in 1590. Although it would magnify an image, it was not always clear or sharp. By the mid-1600s, another Dutch scientist, Anton Van Leeuwenhoek, made an improved microscope. It allowed him to see an image up to 270 times larger than its actual size. Van Leeuwenhoek reported being able to see things in pond water that no one had ever imagined before.

3. In 1665, when the microscope was improved, an English scientist, Robert Hooke, looked at a very thin slice of cork made from a tree under a microscope. Hooke observed what appeared to be empty, box-like structures that reminded him of rooms, or cells, that monks lived in. That is how the cell got its name. However, all cells do not look like the square shape of a plant cell. Human, bacterial, fungal, and algal cells all take on different shapes. As cells were studied over time, different observations and conclusions were made by numerous scientists. Together, their explanations became known as the cell theory, one of the major theories in science. These are the major ideas of cell theory:

   1. All organisms are made up of one or more cells.
   2. Cells are the basic units of structure and function in all organisms.
   3. All cells come from cells that already exist.

Today, cell theory is the basis scientists use to study the parts of cells and how they are organized, reproduce, and change through time.
4 Scientists have found that cells are organized in two different groups: prokaryotic and eukaryotic. Prokaryotic cells, such as bacteria, have no membrane around their genetic material. Eukaryotic cells, found in animal and plant cells, have a nucleus with a membrane around it. The genetic material is kept inside the nucleus.

5 Every cell of eukaryotic organisms, as small as they are, is made up of even smaller parts known as organelles. What does the name “organelle” mean? Organelle means “little organ”. In your body, there are many different organs, each with a unique function. Each must work together to sustain life. In a similar way, each organelle has a designated job to do that is essential for the overall survival of the cell. Some of these tasks include obtaining energy from food, moving waste to be expelled from the cell, and storing material. Organelles are surrounded by membranes and are found in the cytoplasm.

6 All cells have a cell membrane that covers the outside of the cell. The cell membrane separates the interior of the cell from its surrounding environment. One of its purposes is to regulate what enters and leaves the cell. The cell membrane keeps materials the cell needs inside the cell. It also prevents harmful substances from entering. The cell membrane also allows food and oxygen (nutrients) to be absorbed into the cell through the membrane. Excreted waste products are expelled through the cell membrane. This is similar to the way the skin of an animal functions to protect the inner regions of the body.

7 In organisms such as plants, fungi, algae, and many bacteria, the cell membrane is surrounded by a cell wall. Animal cells never have a cell wall. The cell wall helps to protect and support the cell. The structure is made of bundles of tough cellulose fibers and other materials made by the cell. In a multicellular organism, the cell walls of all the cells together provide structure to the whole organism, much like a skeleton.

8 The nucleus is a structure that directs all the activities of the cell. It is the control center of the cell, in the same way that the brain is the control center of an animal. The instructions that keep the cell running properly come from the nucleus. The nucleus is the largest organelle in the cytoplasm of a eukaryotic cell. The nucleus is separated from the cytoplasm by a membrane. It contains genetic blueprints for the functions of the cells in the form of DNA, our genetic makeup.

9 Endoplasmic reticulum (ER) is a complex series of folded membranes inside the cytoplasm of the cell. It allows material to be processed and passed throughout the cell. Think of this tubular membrane as the circulatory system in an animal, moving materials where they need to go. The ER takes up a lot of space within some cells. It extends from the nucleus to the cell membrane.
A living cell also constantly produces waste products. Like an organism as a whole, the cell must remove these wastes. In the cytoplasm, organelles called lysosomes contain chemicals that aid in breaking down food, cell waste, and worn-out organelles. Lysosomes also recycle substances inside the cell. Waste products the lysosome cannot break down are enclosed in a membrane and moved out of the cell.

All of these parts of the cell are not just thrown together. Each has a special purpose and function, just like the organs within your own body have a specific purpose. In fact, each cell performs functions which are similar to the body functions of complex organisms. It is amazing that a cell has that much power and control, considering it is the smallest unit of life!
1. What is the main point of this passage?

A. Each cell performs functions that are similar to those of an entire organism.
B. A living cell doesn’t make waste products.
C. Microscopes were invented in 1590. Improvements have allowed scientists to study cells and their components.
D. Cell theory tells us that cells are the basic unit of life, organisms are made up of cells, and new cells come from existing cells.

2. The cell theory was developed as a result of which of the following?

A. The sole use of a microscope in labs
B. Observations and conclusions of many scientists
C. An English scientist, Robert Hooke
D. A Dutch scientist, Anton Van Leeuwenhoek
Examine the diagram of a cell above. Based on the description in this passage, which part of the organism performs a function similar to the part of the cell marked with the arrow?

A. Blood vessels  
B. Skin  
C. Bones  
D. Brain
4. Which body system has a function most similar to the role the lysosome plays for a cell?

A. Skeletal system
B. Nervous system
C. Excretory system
D. Circulatory system

5. What is the definition of a cell, according to this passage?

A. Genetic blueprints for the function of a cell
B. Proteins and the chemical that controls the activities
C. A complex series of folded membranes in the cytoplasm
D. The smallest units whose purpose is to carry out all of the activities of life in organisms

6. What is the meaning of the word *regulate* in Paragraph 6?

A. Control
B. Protect
C. Stop
D. Allow