

Lesson 1

Cells in Biology

Jump-Start Your Learning

Before you begin reading, take a piece of paper and write "Cells" across the top. Then, as fast as you can, jot down any notes, facts, opinions or thoughts you have about cells. Don't worry about being correct or writing correct sentences. You want to be quick to jump start your thinking. Do this for one minute.

Vocabulary

cell
chlorophyll
tissue
organ
organ system



In biology, the cell is the basic structure of organisms. All cells are made by other cells. The outside of the cell is a cell membrane. Inside some cells, some parts of the cell stay separate from other parts by membranes. These separate parts are called organelles (like small organs.) They each do different things in the cell. Some of these are ribosomes, nucleus (where DNA is), and mitochondria.

Cell History

Cells were discovered by Robert Hooke. He used a microscope to look at organisms in 1665. He named cells after the Latin word *cella*, meaning room. He did this because he thought cells looked like small rooms. The idea of cell was then deeper explored by a Czech J.E. Purkyně in 1837. Finally, three German biologists — Schleiden, Schwann and Virchow — figured out three rules about all cells:

1. All living things are made of cells
2. The cell is the basic unit of structure and function in all organisms.
3. Every cell comes from another cell that lived before it.



Nucleus

(cell control center that directs everything the cell does)

Vacuole

(storage space that stores food, water, and wastes)

Cytoplasm

(material that suspends cell parts)

Chloroplast

(cell part that contains chlorophyll)

Mitochondrion

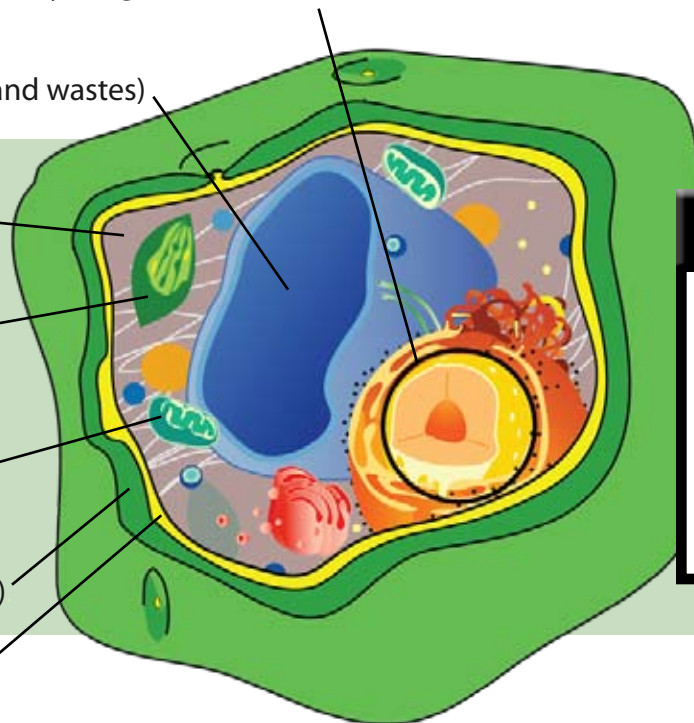
(cell energy processor that helps supply energy for the cell)

Cell Wall

(rigid wall that surrounds the plant cell)

Cell membrane

(holds cell together)



Plant Cell

Plant cells contain chlorophyll and have a cell wall that is rigid.

Plant cell: Mariana Ruiz

It was in 1838 and 1839. These ideas still are the basic ideas of cell theory.

Kinds of Cells

There are 2 basic kinds of cells: prokaryotic cells and eukaryotic cells. Prokaryotes are simple cells, also known as bacteria. Eukaryotes are less simple cells. All eukaryotic cells have a nucleus except red blood cells in mammals, while prokaryotes do not have one. Both kinds of cells have RNA or DNA. In general, prokaryotes (organisms with prokaryotic cell) have genetic information stored in RNA while eukaryotes have genetic information stored in form of DNA. In the prokaryote it is not separated from the rest of the cell by a membrane. In the eukaryote DNA is separate from the rest of the cell. In the eukaryotes DNA is coiled in structures called chromosomes within the nucleus. In general, all prokaryotic organisms are made of just one cell.

Kinds of Prokaryotic Organisms

The only kinds of prokaryotic organisms that survived to the present are bacteria. Prokaryotic organisms evolved before eukaryotic organisms, so at one point the world consisted of nothing but prokaryotic organisms.

Reading Check

Can you name one thing that animal and plant cells have in common?

Using Diagrams for Understanding

Demonstrate your understanding of differences between plant and animal cells. Write a short paragraph.

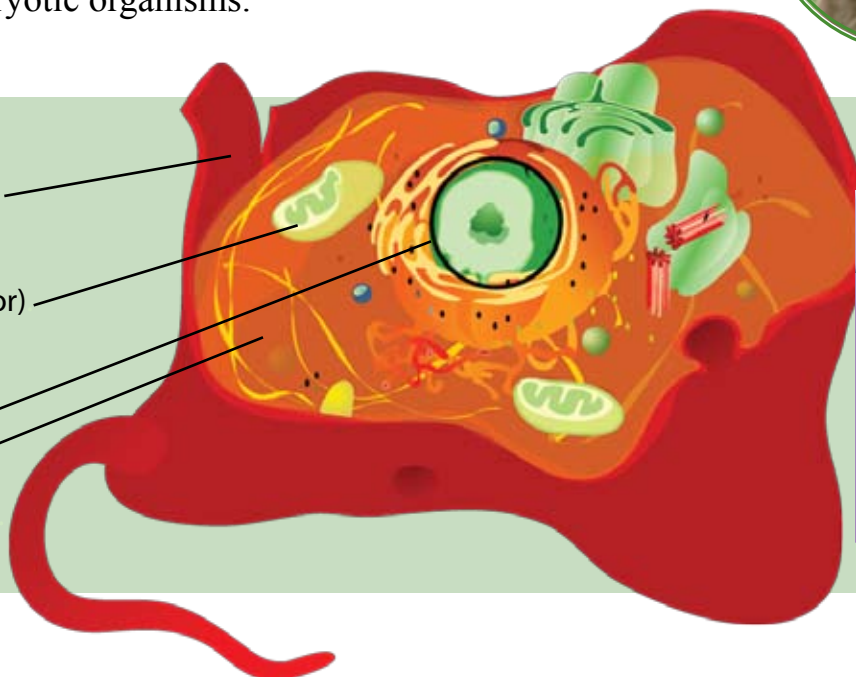


Cell membrane
(holds cell together)

Mitochondrion
(cell energy processor)

Nucleus
(cell control center)

Cytoplasm
(suspends cell parts)



Animal Cell

Animal cells do not contain chlorophyll nor do they have a cell wall.

Kinds of Eukaryotic Organisms

There are two kinds of organisms: multicellular and unicellular. There are also 2 kinds of cells with no nucleus.

Unicellular

Unicellular organisms are made up of one cell. Examples of unicellular organisms are:

1. Amoeba
2. Paramecium

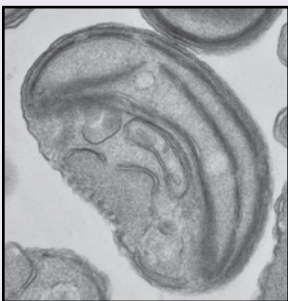
Unicellular organisms live without other cells to help them. So the cell does all things that it needs to live. Each cell —

1. eats
2. moves
3. respire (uses oxygen to make sugar into energy)
4. gets rid of waste
5. reproduces (make more of itself)
6. senses its environment
7. grows (mitochondrion uses oxygen for growth)

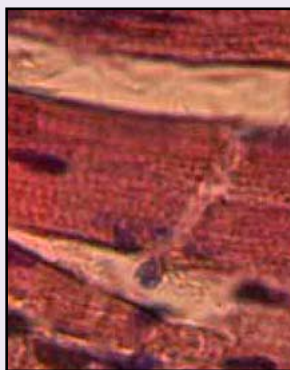
Using Charts for Understanding

Think of a many-celled organism. Name an example of each level of organization.

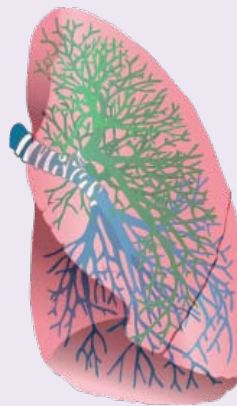
Levels of Organization of Organisms



Cell



Tissue



Organ



Organ System



Many-celled Organism

Multicellular

Multicellular organisms are made from many cells. They are complex organisms. This can be a small number of cells, or millions of cells. All plants and animals are multicellular organisms. The cells of a multicellular organism are not all the same. They have different shapes and sizes, and do different work in the organism. The cells are specialized. This means they do only some kinds of work. By themselves, they cannot do everything that the organism needs to live. They need other cells to do other work. They live together, but cannot live alone.

Cell Reproduction

Eukaryotic cells reproduce differently than prokaryotic cells, but both go through the same general process. Most eukaryotic cells undergo mitosis, creating exact genetic copies of themselves. Exceptions to this rule are nerve cells, which never split, and sex cells, which go through a separate process called meiosis. Prokaryotic cells reproduce using binary fission, where the cell simply splits in half without the complex steps of big tigers.

Question —

What is required for an organ system?



Make a Model: Plant Cells

Make a model cell out of gelatin as cytoplasm with candies, fruits and vegetables as structures in the cell.

1. Select fruits, candies and vegetables for parts of the cells.

Examples:

Chopped Celery = Mitochondrion

Shredded Carrots = other cell parts

Grape halves = other cell parts

Diced peaches = Chloroplast

Whole cherry = Nucleus

Marshmallow = Vacuole

2. Select a light-colored gelatin
Example: lemon or clear
3. Select a low-walled mold to represent the cell wall.
4. Gather the fruits, candies and vegetables
5. Prepare the gelatin according to package directions.
6. Pour into the mold.
7. Stir in the "cell parts" and allow to set.
8. When set, observe the model and discuss how the model is like and unlike an actual plant cell.

In Review

What's Important

All living things are made of cells. The cell is the basic unit of life. Cells have systems that allow them to carry out all life processes. Some organisms have one cell and some have many cells. Many-celled organisms have cells that organize internally from cells to tissues to organs to organ systems.

There are similarities among organisms. All many-celled organisms are organized in cells, tissues, organs and organ systems. All these levels of organization are used to classify organisms.

Think and Write

1. What do all living things have in common?
2. What does the cell wall in plant cells do for plants?
3. What are some examples of animal tissue?
4. What are the two main organ systems of plants?

Critical thinking —

Why are cells called the building blocks of life?

CONNECTIONS



Writing Connection

Compare and Contrast

Write a short essay about cells. Use a VENN diagram to organize your thoughts. How are animal and plant cells different? How are they the same?



Math Connection

Big Numbers

Some many-celled organisms, such as humans, have trillions of cells. Write out the number a trillion. (It is the number 1 with 12 zeros.) If there are a trillion cells in an organism, how many cells do you estimate are in $\frac{1}{2}$ of that organism?



Art Connection

Make a Poster

Demonstrate your knowledge of how cells organize. Remember that cells are the basic unit of life. They come together to form tissues and they form organs. Several organs work together in organ systems. Select a plant or animal and make a poster using drawings or photographs.



Technology Connection

On the Web

There are many science sites for students. One to try is: www.biology4kids.com