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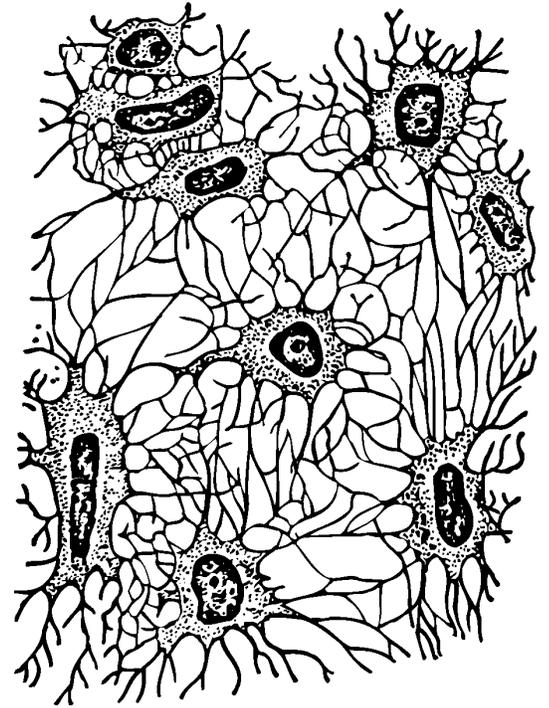
## Cells: Plants & Animals

Cells are known as the building blocks of life. All living things are made up of these tiny units of life, including every flower you've ever admired, every member of your family, and every pet you've ever owned! In fact, your own cells are dividing and growing as you read this webquest *right now*! Follow along to find out how these building blocks work for you!

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### Find It!

Find the answers to the questions below by using the search tool to search key words. Since this activity is about cells, you can start by searching the word "cell."

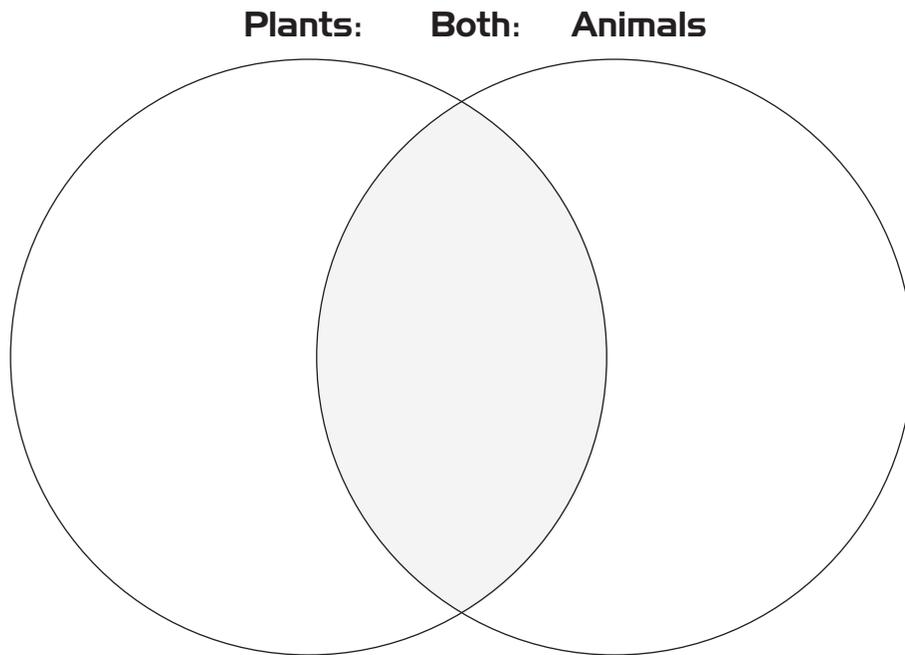


Write the answers on the lines provided or in the space below the question.

1. A cell is the \_\_\_\_\_ of all \_\_\_\_\_. (3 words)
2. List at least two examples of single-celled organisms:
3. How many cells are in the human body?
4. Nearly all the cells of plants and animals have \_\_\_\_\_. (2 words)
5. Groups of cells that work together form the different \_\_\_\_\_ of the body.
  - a. Specialized cell
  - b. Organ
  - c. Organism
  - d. Tissue
6. List three examples of tissues:
7. List three examples of organs:
8. Name at least five ways that all cells are similar:

**\*Users of the Advanced database can find extension activities at the end of this webquest.**

9. List at least seven similarities and seven differences between a typical animal and typical plant cell in the Venn Diagram below (Hint: You may want to refer to the cell article and the image titled “Structures of a cell” to find this answer.)



10. A(n) \_\_\_\_\_ microscope can magnify a cell up to 2,000 times.
11. A(n) \_\_\_\_\_ microscope can magnify a cell up to 1 million times.
12. *True or False:* Cells come in many different shapes and sizes. A cell’s shape is related to its needs or to the job it does. (If false, make changes to make the statement true.)
13. *True or False:* Bacteria are extremely small, single-celled organisms that have a true nucleus. (If false, make changes to make the statement true.)
14. What is a *daughter cell*?
15. Cell division involves two processes: *nuclear division* and *cytokinesis*. Define these two terms. (Hint: You may want to refer to the “Cell division” video found within to the cell article.)
- Nuclear division:
- Cytokinesis:

16. Use the article to understand the process of meiosis. Use the descriptions to draw pictures of the four stages.

Stage 1:	Stage 2:
Stage 3:	Stage 4:

17. *True or False:* Meiosis is a specialized form of cell division that occurs in certain cells of human beings and many other living things that reproduce asexually.

[If false, make changes to make the statement true.]

18. During cell division, a cell must go through four important cycles. Explain what happens at each step. Then, draw a picture or icon to represent that step as if it were an app on a smartphone.

<i>Describe the importance of each phase:</i>	Icon:
G <sub>1</sub> :	
S:	
G <sub>2</sub> :	
M:	

19. What is *differentiation*? Why is differentiation such a challenging problem?
20. *True or False*: Liver cells live about 10 days. [If false, make changes to make the statement true.]
21. In what two ways does DNA control the life of the cell—and the lives of organisms made up of cells?
22. The DNA ladder includes four building blocks called \_\_\_\_\_. In DNA, each \_\_\_\_\_ consists of a sugar called \_\_\_\_\_ joined to a \_\_\_\_\_ and one of four compounds called \_\_\_\_\_.
23. What are the four bases, their abbreviations, and the combinations in which they can be?

24. Complete the other half of the DNA ladder by pairing up their complimentary bases.  
TAGCTACTACCTGGATCGAGCAT

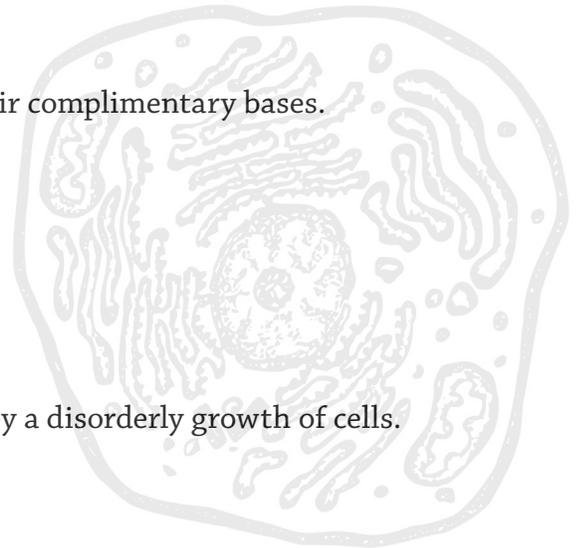
25. Complete the other half of the RNA strand.  
TAGCTACTACCTGGATCGAGCAT

26. \_\_\_\_\_ is a \_\_\_\_\_ marked by a disorderly growth of cells.

27. How do viruses cause disease?

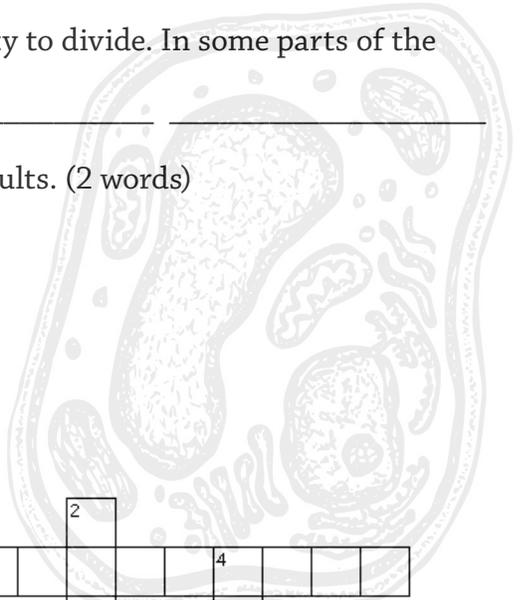
28. Match the key moment in cell history on the left with the correct year(s) on the right.  
(Hint: You may want to refer to the “Highlights in Cell Research” timeline found within to the cell article!)

- |  |                |
|--|----------------|
| _____ Doctors first used gene therapy as a treatment for disease     | A. 1838        |
| _____ Arthur Kornberg produced DNA in a test tube                    | B. mid-1800's  |
| _____ Matthias Schleiden called the cell the basic unit of life      | C. late 1800's |
| _____ Scientists announced the creation of a synthetic cell          | D. 1944        |
| _____ Gregor Mendel's research formulated the basic laws of heredity | E. 1957        |
| _____ Scientists discovered that cells reproduce by division         | F. 2010        |
| _____ Oswald T. Avery discovered that DNA alone determines heredity  | G. 1990        |



29. Most of the cells in the human body eventually lose the ability to divide. In some parts of the body, however, a small number of cells known as \_\_\_\_\_ retain the ability to divide and replenish lost cells, even in adults. (2 words)

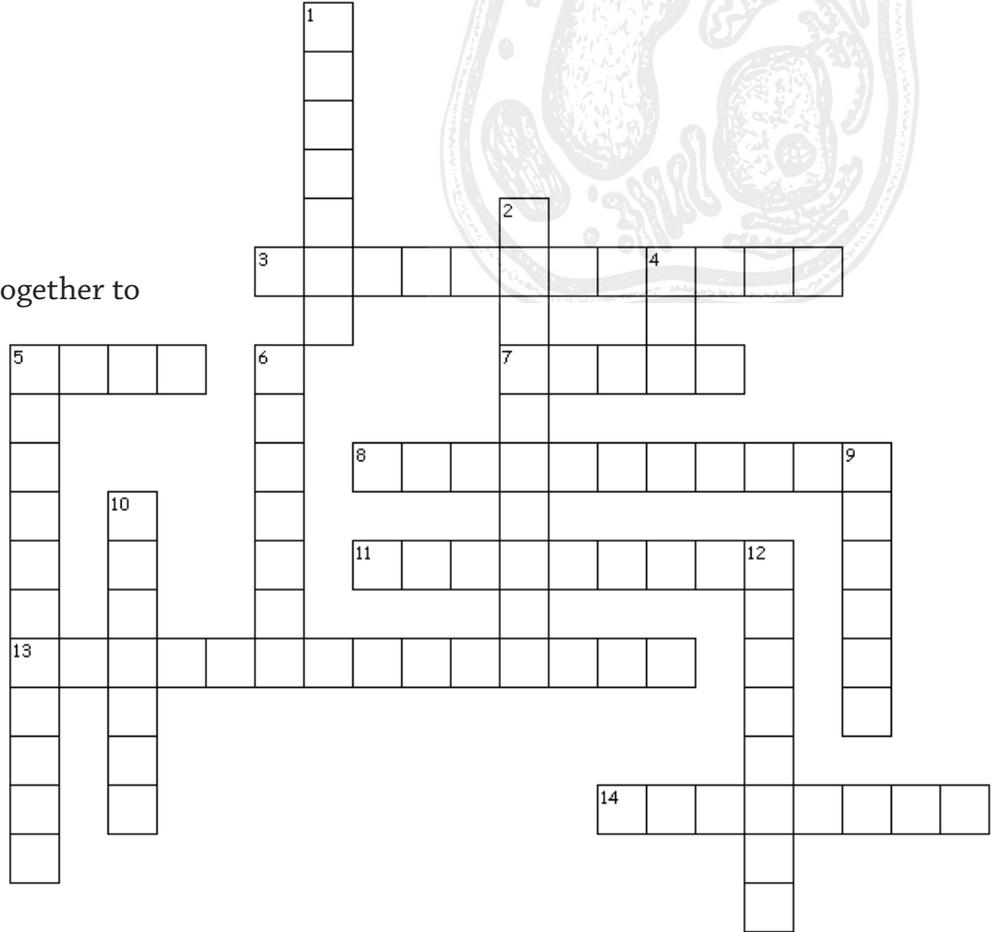
30. Why are synthetic cells important?



## What's the Word?

### Across

3. The 'power plants' of the cell
5. Basic unit of all life
7. Groups of tissues that work together to perform a particular function in an organism
8. Organelle in cells of plants and algae that contains chlorophyll
11. The contents inside the cell membrane
13. Food-making process that occurs in green plants, algae, and certain microscopic organisms
14. Living thing



### Down

1. The process by which most eukaryotic cells divide
2. Tiny, thin, threadlike structure found in cells of all organisms; holds the genes
4. Genetic material that directs the formation, growth, and reproduction of cells and organisms
5. Green substance that captures the energy of sunlight
6. Structure that holds most of the cell's hereditary material
9. A group of similar cells that work together to perform a particular function in an organism
10. Specialized form of cell division that occurs in certain cells of human beings and many other living things that reproduce sexually
12. Covering that encloses the cell, separating the cell's contents from its surroundings

## Extension Activities I

There is a lot to learn about cells and the explanations tend to be very complex. However, it is important to understand the basic building blocks of life. Imagine that you are part of a traveling actors troupe that has been hired to teach young children about the different parts of an animal and plant cell, cell division, and the work of a cell.

Write a short, narrative play using simple characters to teach children the basics. Each actor in your troupe will personify or demonstrate each learning objective in a form simple enough for a child to understand.

Then, act it out!

## Extension Activities I

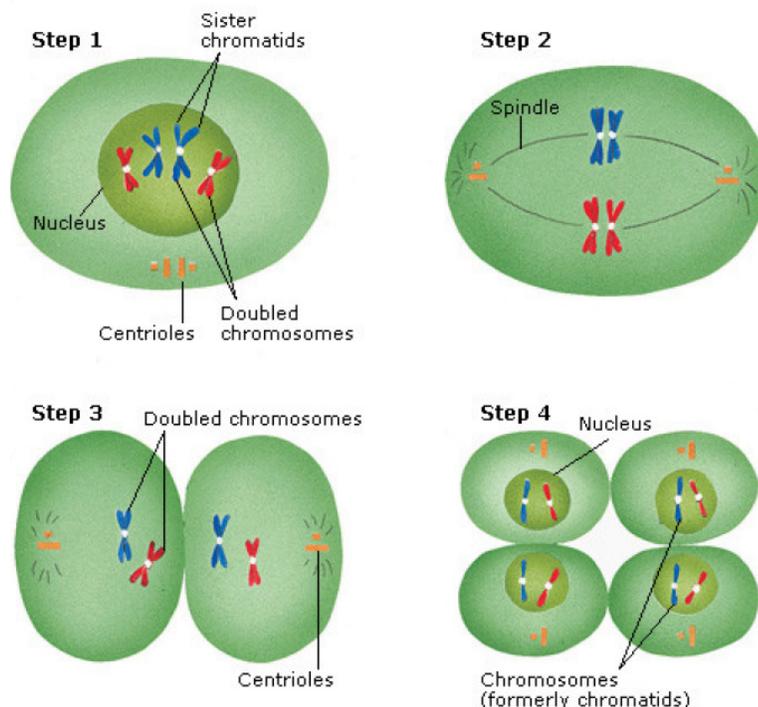
Plant and animal cells have very specific structures that allow them to thrive. They can also be quite beautiful. You have been commissioned by a local art museum to paint, draw, or sketch a picture of the two different types of cells. Create accurate, but artistic, pictures that everyone in your community can see and enjoy.



# Teacher Page

## Answers:

1. A cell is the basic unit of all life. (3 words)
2. Examples of single-celled organisms: Bacteria, yeasts, ameba, one-celled algae
3. 10 trillion
4. Nearly all the cells of plants and animals have specialized jobs. (2 words)
5. d. Tissue
6. List three examples of tissues: Skin, nerve, and muscle tissue
7. List three examples of organs: Brain, eyes, heart, lungs, etc.
8. All cells are alive. Cells “breathe,” take in food, and get rid of wastes. Cells also grow and reproduce (create more of their own kind). And in time, cells die.
9. Typical animal and plant cells will both contain endoplasmic reticulum, mitochondrion, golgi complex, nucleolus, nucleus, nuclear membrane, cytoplasm.  
Only plant cells contain a cell wall, vacuole, and chloroplast.  
Only animal cells contain a cell membrane, robisome, centrioles, and lysosome.
10. A(n) optical microscope can magnify a cell up to 2,000 times.
11. A(n) electron microscope can magnify a cell up to 1 million times.
12. **True**
13. **False:** Bacteria are extremely small, single-celled organisms that ~~have~~ lack a true nucleus.
14. In multicellular eukaryotes, each of the two new cells produced by division is often called a daughter cell
15. In nuclear division, the nucleus divides. In the second process, cytokinesis, the cytoplasm divides, and the cell splits in half.
16. Draw out the steps of *meiosis*. →
17. **False:** Meiosis is a specialized form of cell division that occurs in certain cells of human beings and many other living things that reproduce asexually.



18.

Describe the importance of each phase:	Icon:
G <sub>1</sub> : The cell is preparing all of the enzymes and other ingredients that it will need to copy its genetic material.	Pictures will vary.
S: The cell makes or synthesizes a copy of the genetic material.	
G <sub>2</sub> : New copies of organelles and other parts of the cell are made.	
M: The division of the nucleus and the cell itself.	

19. Differentiation is when the cells begin to *differentiate* (specialize) and become muscle cells, skin cells, nerve cells, and so on. It is a challenging problem, because scientists think that differentiation occurs when a specific set of genes become active in a cell. Much remains to be learned about how only certain genes are activated in each type of cell.
20. **False:** Liver cells live about 10 ~~days~~ months.
21. First, DNA determines the form and function of the cell by determining when and where different proteins are produced. Second, DNA carries the hereditary information that is passed from one generation of cells to the next and from parents to children.
22. The DNA ladder includes four building blocks called nucleotides. In DNA, each nucleotide consists of a sugar called deoxyribose joined to a phosphate and one of four compounds called bases.
23. What are the four bases, their abbreviations, and the combinations in which they can be?
- The four bases are adenine (A), cytosine (C), guanine (G), and thymine. (T) and (U)  
(And thymine is abbreviated T in DNA. In RNA, thymine is replaced with Uracil, abbreviated U.)
- Adenine can only pair with thymine (uracil in RNA), making an A-T or T-A pair. Cytosine can only pair with guanine, making a C-G or a G-C pair.
24. Complete to other half of the DNA strand.  
TAGCTACTACCTGGATCGAGCAT  
ATCGATGATGGACCTAGCTCGTA
25. Complete the other half of the RNA strand.  
TAGCTACTACCTGGATCGAGCAT  
AUCGAUGAUGGACCUAGCUCGUA

26. Cancer is a disease marked by a disorderly growth of cells.
27. Virus diseases occur when a virus invades a cell. Inside a living cell, viruses become active and capable of reproduction. After a virus enters a cell, it may take over the cell's machinery to produce copies of itself.
28. Match the key moment in cell history on the left with the correct year(s) on the right.
- |   |                |
|---|----------------|
| Doctors first used gene therapy as a treatment for disease:     | G. 1990        |
| Arthur Kornberg produced DNA in a test tube:                    | E. 1957        |
| Matthias Schleiden called the cell the basic unit of life:      | A. 1838        |
| Scientists announced the creation of a synthetic cell:          | F. 2010        |
| Gregor Mendel's research formulated the basic laws of heredity: | B. mid-1800's  |
| Scientists discovered that cells reproduce by division:         | C. late 1800's |
| Oswald T. Avery discovered that DNA alone determines heredity:  | D. 1944        |
29. In some parts of the body, however, a small number of cells known as stem cells retain the ability to divide and replenish lost cells, even in adults. (2 words)
30. Synthetic cells are important, because scientists believe this achievement is an important step toward the goal of creating true artificial cells. These artificial cells can then go on to cure diseases or help create new breakthroughs in cell science.

## What's the Word:

### Across

3. mitochondria
5. cell
7. organ
8. chloroplast
11. cytoplasm
13. photosynthesis
14. organism

### Down

1. mitosis
2. chromosomes
4. DNA
5. chlorophyll
6. nucleus
9. tissues
10. meiosis
12. membrane

## Extension Activities 1 & 2: Answers will vary.