

## Reinforcement Worksheet – Cell Theory, Scientists, & Cell Types

**KEY CONCEPT** Cells are the basic unit of life.

The invention of the microscope in the late 1500s revealed to early scientists a whole new world of tiny cells. Most cells are so small that they cannot be seen without a microscope. The discoveries of scientists from the 1600s through the 1800s led to the cell theory, which is a unifying concept of biology. The cell theory has three major principles:

- All organisms are made of cells.
- All existing cells are produced by other living cells.
- The cell is the most basic unit of life.

All cells can be divided into two major groups: prokaryotic cells or eukaryotic cells. The main differences between the two kinds of cells are in their structure:

- Eukaryotic cells have a nucleus defined by a membrane, while prokaryotic cells have no nucleus.
- In eukaryotic cells, the DNA, or genetic information, is found in the nucleus. In prokaryotic cells, the DNA is found in the cytoplasm, the jellylike substance that fills both types of cells.
- Eukaryotic cells have organelles, structures that perform jobs for a cell. Most organelles are surrounded by membranes. Prokaryotic cells do not have organelles surrounded by membranes.

Prokaryotic cells make up organisms called prokaryotes. All prokaryotes are tiny and consist of single cells. Bacteria are prokaryotic cells. Eukaryotic cells make up eukaryotes. You are a eukaryote, as are plants and some types of single-celled organisms. All multicellular organisms, or organisms that have many cells, are eukaryotes.

1. What is the smallest, most basic unit of life? \_\_\_\_\_

2. Where is the DNA in a prokaryote? in a eukaryote?

\_\_\_\_\_

\_\_\_\_\_

3. Why would you need a microscope to see a prokaryotic organism?

\_\_\_\_\_

\_\_\_\_\_

4. A friend tells you he read somewhere that rotting garbage can turn into maggots, which are fly larvae, and the maggots then can grow into adult flies. What part of the cell theory could you use to refute his claim?

\_\_\_\_\_

\_\_\_\_\_

**MAIN IDEA:** Early studies led to the development of the cell theory. In a phrase, tell what each scientist did to help develop the cell theory.

Scientist	Contribution to Cell Theory
5. Hooke	
6. Leeuwenhoek	
7. Schleiden	
8. Schwann	
9. Virchow	

10. What are the three parts of the cell theory?

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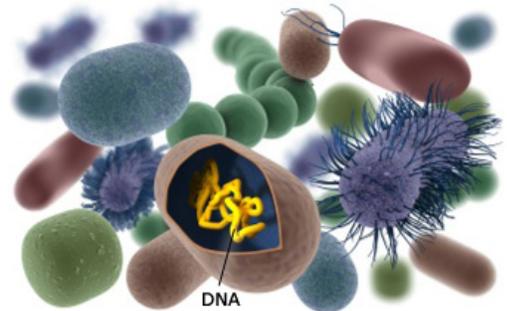
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Read the information and answer the questions:

### THE EVOLUTION OF THE CELL

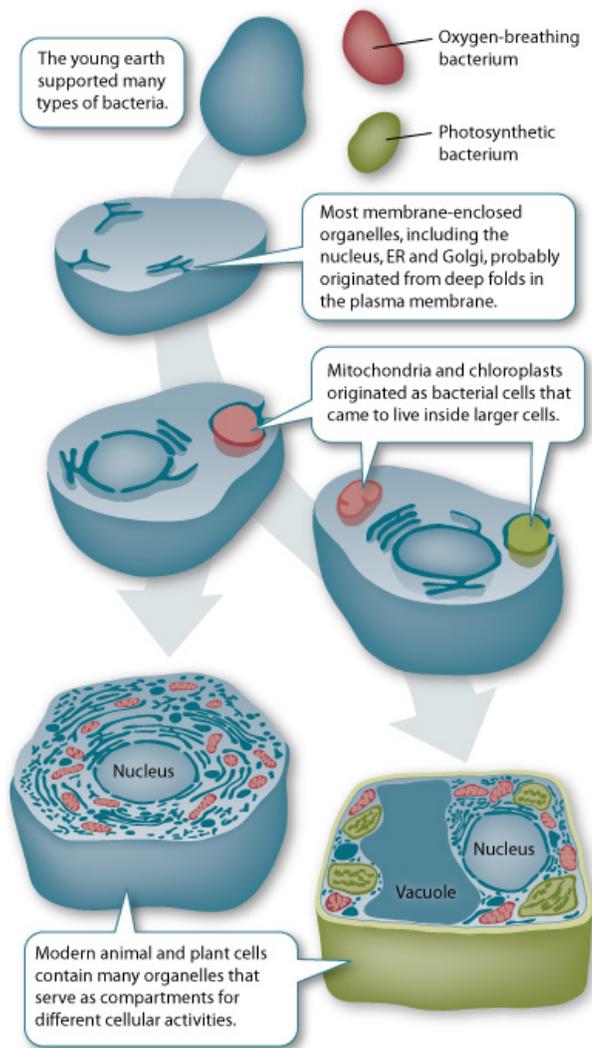
#### The Cells That Changed The Earth

Some of the oldest cells on Earth are single-cell organisms called bacteria. Fossil records indicate that mounds of bacteria once covered young Earth. Some began making their own food using carbon dioxide in the atmosphere and energy they harvested from the sun. This process (called photosynthesis) produced enough oxygen to change Earth's atmosphere. Soon afterward, new oxygen-breathing life forms came onto the scene. With a population of increasingly diverse bacterial life, the stage was set for some amazing things to happen.



**11. Based on the paragraph, what is the process of photosynthesis?**

**12. Based on the paragraph, what is the process of photosynthesis?**



## The Endosymbiotic Theory

There is compelling evidence that mitochondria and chloroplasts were once primitive bacterial cells. This evidence is described in the endosymbiotic theory. How did this theory get its name? Symbiosis occurs when two different species benefit from living and working together. When one organism actually lives inside the other it's called endosymbiosis. The endosymbiotic theory describes how a large host cell and ingested bacteria could easily become dependent on one another for survival, resulting in a permanent relationship. Over millions of years of evolution, mitochondria and chloroplasts have become more specialized and today they cannot live outside the cell.

**13. How did the theory get its name?**

**14. Why can't chloroplasts and mitochondria live outside of the cell now?**

## "It's Just A Theory"

In everyday speech, people use the word theory to mean an opinion or speculation not necessarily based on facts. But in

the field of science, a theory is a well established explanation based on extensive experimentation and observation. Scientific theories are developed and verified by the scientific community and are generally accepted as fact.

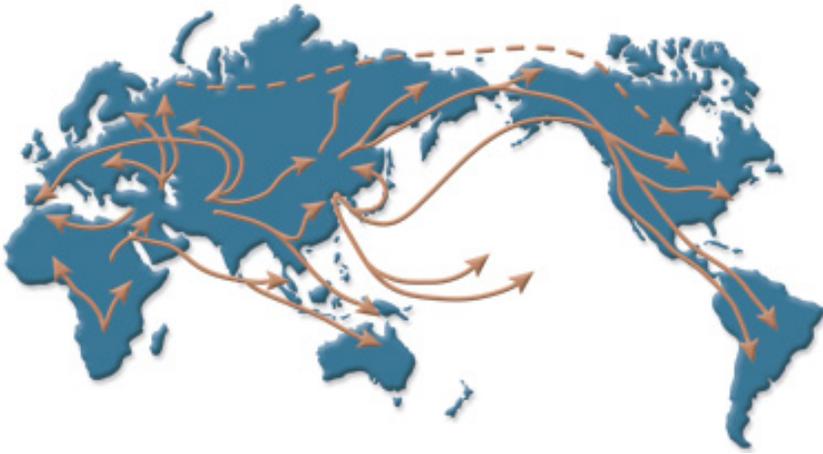
**15. What is the difference between the word "theory" when used in everyday life and the word "theory" when used in science?**

## Mitochondria Have DNA

Mitochondria and chloroplasts have striking similarities to bacteria cells. They have their own DNA, which is separate from the DNA found in the nucleus of the cell. And both organelles use their DNA to produce many proteins and enzymes required for their function. A double membrane surrounds both mitochondria and chloroplasts, further evidence that each was ingested by a primitive host. The two organelles also reproduce like bacteria, replicating their own DNA and directing their own division.

**16. What are two pieces of evidence that mitochondria were once their own living creatures?**

## Drawing The History Of Evolution



Mitochondrial DNA (mtDNA) has a unique pattern of inheritance. It is passed down directly from mother to child, and it accumulates changes much more slowly than other types of DNA. Because of its unique characteristics, mtDNA has provided important clues about evolutionary history. For example, differences in mtDNA are examined to estimate how closely related one species is to another. Analysis of mitochondrial DNA from people around the world has revealed many clues about ancient human migration patterns.

**17. Why can mtDNA be used to see how closely related we are?**

## Archaea: Models For Astrobiology



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Conditions on Earth 4 billion years ago were very different than they are today. The atmosphere lacked oxygen, and an ozone layer did not yet protect Earth from harmful radiation. Heavy rains, lightning and volcanic activity were common. Yet the earliest cells originated in this extreme environment. Today, a group of single-celled organisms called archaeabacteria, or archaea, still thrive in extreme habitats.

**18. How did ancient Earth differ from Earth today?**

Astrobiologists are now using archaea to study the origins of life on Earth and other planets. Because archaea inhabit places previously considered incompatible with life, they may provide clues that will improve our ability to detect extraterrestrial life. Interestingly, current research suggests archaea may be capable of space travel by meteorite. Such an event could have seeded life on Earth or elsewhere.

**19. Why is the fact that Archaea might be able to travel in space be important for life on Earth?**

**20. What are two things you learned in this reading?**