

Lesson 1

WHAT ARE LIVING THINGS MADE OF?

WORDS TO KNOW

cell

unicellular

multicellular

THE BIG IDEA

- All living things are made up of cells, the smallest units of life.
- An organism may consist of one single cell (unicellular) or many types of cells (multicellular).

THINK ABOUT IT

What are examples of unicellular organisms?

WHAT I NEED TO KNOW

Have you ever looked at a drop of pond water under a microscope? Before you looked more closely under the microscope, the water drop may have looked clear, as if it had nothing in it. When you see the drop magnified a whole new world appears. You may see small, green objects float into view. A strange creature with a whip like tail might race through the water. You might even see a moving blob that looks like jelly.

Not everything in the drop of water is living, of course. You might see specks of dust, the remains of once-living things and, of course, the water itself. In order to classify it as a living thing, an organism must meet all of the following criteria.

- It must be made of **cells**, the basic units of life.
- It uses energy to live. (This includes respiration, consuming food, and excretion.)
- It grows and develops.
- It reproduces.
- It responds to its surroundings. (This includes movement, adaptations, and stimuli.)

Once-living things may meet some of these criteria. For example, a dead plant will still have cells, and recently dead things may be hard to differentiate from living things. Once-living things will decompose until they break down completely, eventually becoming part of soil or the muddy bottom of the pond.

TURN AND TALK

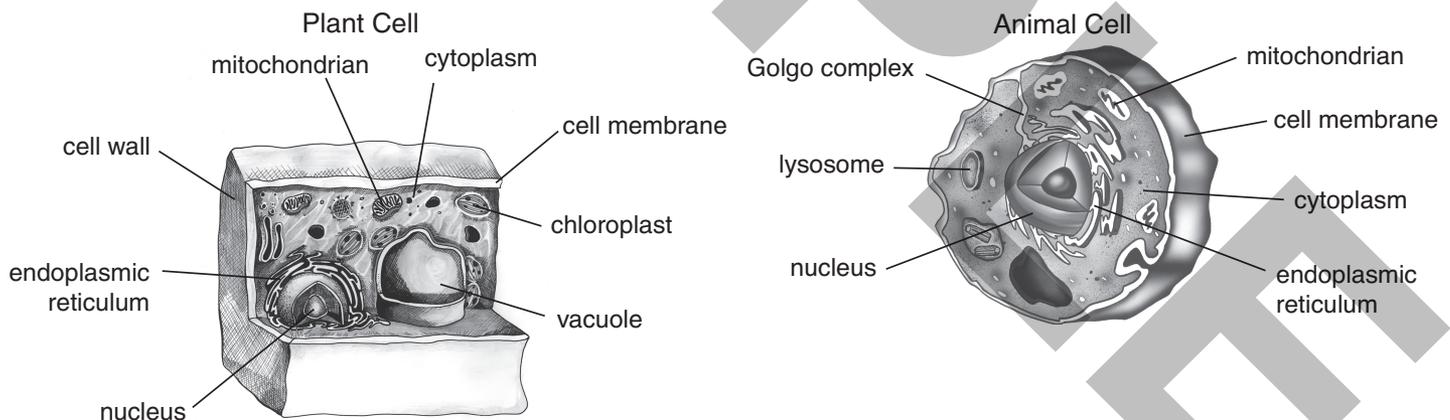
Discuss with a partner what happens to the cells of once-living things.

Every organism in the water drop is made of one or more cells, whereas the non-living things in the drop—like the water itself—are not made of cells. Cells perform all the functions necessary for life. They give an organism structure and separate it from the outside world. Cells break down food in order to provide energy and nutrition to the organism. Cells remove any waste the organism creates. They also allow the organism to grow and reproduce.

Organisms are made of one or more cells. Most of Earth's organisms are **unicellular**, which means they consist of only one cell. Unicellular organisms are a diverse group, ranging from bacteria that do not have a nucleus, to protists such as amoeba and euglena, which do have a nucleus. Some algae also consist of single cells. In each unicellular organism, all life functions are performed by different structures within the cell.

Most organisms are single cell. Some organisms are **multicellular** and consist of more than one cell. Multicellular organisms can range from algae, which may be made of a few cells, to humans who consist of billions of cells. Most plants and animals are multicellular organisms. Multicellular organisms often develop specialized cells. In the human body, for instance, specialized cells in the stomach help the organ perform digestion while specialized cells in the nose help the body sense smells. This cell specialization allows multicellular organisms to be amazingly diverse and complex.

Cells in most organisms have similar structures. The images below show a typical plant and animal cell, with important structures labeled.



WHAT I HAVE LEARNED

1. A student is planning an investigation in which he will examine a slide of unknown material under a microscope. What evidence would demonstrate that the material is a living thing?

- (A) The material is multicellular.
- (B) The material is made of cells.
- (C) The material is made of atoms.
- (D) The material is able to move independently.

HINT, HINT

Consider the list of criteria for what is a living thing.

2. In the 1600s, an amateur Dutch scientist observed through a microscope simple cells called *protists*. His observations led to the development of the Cell Theory, the idea that all living things are made of cells. What does this incident illustrate about the scientific process?



- (A) An understanding of complex ideas can take several hundred years.
- (B) Tools such as microscopes are required to make scientific breakthroughs.
- (C) Human understanding of science is often linked to engineering advances.
- (D) Most discoveries do not come from trained scientists but from curious people.

SKETCH IT

Sketch simple diagrams of living and non-living cells. What features are present for each type?

3. Students have two glass slides to investigate. The slides may contain cheek cells or a nonliving substance. Which choice describes the process the students should follow and the data they should record to determine what the slides contain?

- (A) Look carefully at one slide under magnification and determine whether it contains cells. Looking at both slides is not necessary.
- (B) Start at the highest magnification level. Molecules should be visible in both slides. Then, reduce the magnification level until a nucleus is visible on only one of the slides.
- (C) The microscope is not necessary for this investigation because the swab of cheek cells will be recognizable as cells without magnification. The students should look at both slides and draw quick sketches of each.
- (D) Increase the magnification until the material becomes visible on both slides. Carefully observe; then draw diagrams to display what you see on each slide. The slide with the cheek cells should have cells with visible nuclei.

4. A student is examining a drop of river water under a microscope. She observes an object moving in the drop, but she cannot determine if the object moved on its own or because she moved the slide. What conclusion can the student make about this object?

- (A) It is living.
- (B) It is nonliving.
- (C) It was once living.
- (D) There is not enough information to form a conclusion.

5. A student planning an investigation to look at cells under magnification believes that a sample from a dead cotton plant will look very different from a sample taken from a living sunflower plant. Which answer **best** explains what the student can expect to find during the investigation?
- (A) The cells will look different because they are different types of cells.
 - (B) The cells will look similar because they are both from unicellular organisms.
 - (C) The cells will look different because the cotton is no longer living but the sunflower is.
 - (D) The cells will look similar, even though the cotton is no longer living, because they are both plant cells.
6. Why are microscopes important for studying cells?
- (A) They help keep the cells in place.
 - (B) The human eye cannot see most cells.
 - (C) Microscopes display the cells in full color.
 - (D) Different types of cells look the same without magnification.

HINT, HINT

Consider the features or structures of the cells you can use for comparison.
