Cell Theory

Grade Range: Middle School  Lesson Time: 40 minutes

Key Terms
- Cell Theory
- Microscope
- Spontaneous generation

Activity Overview
How small is the smallest living organism? If you answered “as small as a cell,” then you are correct! Cells are the smallest unit of life. They can either work individually as a unicellular organism, or work together in a multicellular organism. In this activity, students will investigate how scientists developed the Cell Theory.

Essential Questions
1. What is the Cell Theory?
2. What is the significance of the Cell Theory?
3. What characteristics do all living organisms have in common?

Objectives
- Identify the statements of the Cell Theory
- Investigate how the Cell Theory was developed

Introduction
Prior to beginning this activity, students should review scientific notation and how it is used to measure objects that are either really large or really small.

zSpace Activity

Activity Questions Provided in Studio
Answers may vary. Sample answers are provided below.

1. Cells are the smallest unit of life. Which of these tools helped in the discovery of cells? Why?
   The microscope, because it allowed scientists to see very small organisms up close.

2. The scientist Robert Hooke was the first person to observe cells using a microscope. He called the objects he observed cells because all he could make out with his crude microscope were box-like structures. Look at the structures of the animal cell and plant cell. If Hooke observed box-like structures, what type of cell was he examining?
3. Hooke was looking at cork, which is part of a plant—the bark of a tree. Inspired by Hooke’s discovery, Anton van Leeuwenhoek used his skills as a lens crafter to create his own, powerful microscopes. With his improved microscopes, he was able to see more than cork tree cells.

4. Before the Cell Theory was widely accepted, people believed in the Greek scientist Aristotle’s concept of spontaneous generation. According to Aristotle, life would seemingly appear out of thin air when the right conditions were met. For example, if a piece of meat was left outdoors for a few days, what do you think would appear? How would this support Aristotle’s belief in the spontaneous generation of organisms? *Flies, mold, or maggots would appear on the meat, giving the impression that they appeared out of nowhere.*

5. Before microscopes were available, scientists could not see what was happening at the microscopic level. They were thus unable to develop an accurate hypothesis to explain why maggots, mold, and flies would appear. Explain how the improvement of microscopes helped scientists to disprove spontaneous generation. *Better microscopes allowed scientists to see the cells that would grow into mold or maggots.*

6. Based on their careful observations of cells, Theodor Schwann, Matthias Jacob Schleiden, and Rudolf Virchow, three German scientists, created the Cell Theory. The Cell Theory includes three statements. The first is that all organisms are made of one or more cells. Open your Backpack, select at least three models that support this statement, and add them to the scene. Take a photo.

7. The second is that cells are the basic building blocks of life. Open your Backpack, select at least three models that support this statement, and add them to the scene. Take a photo.

8. The third is that all cells come from existing cells. Open your Backpack, select at least three models that support this statement, and add them to the scene. Take a photo.

9. **How does Cell Theory conflict with the concept of spontaneous generation?**
   *The concept of spontaneous generation assumes that living organisms can appear out of thin air, but Cell Theory states that living things, which are made up of cells, must come from other cells.*

10. Scientists first discovered that cells are the building blocks for plants. Soon after, they learned that cells are also the building blocks for animals. Based on these models, why do you think it was easier for the scientists to observe plant cells than animal cells? *Plant cells have thick cell walls that are easier to dye and see under a microscope.*

11. **Why was the discovery of the Cell Theory important in biology?**
   *The Cell Theory defines the basic building block of life.*

**Closing**

**Exploring the Cell Theory**

Have students examine different samples under a microscope. Explain that, based on their observations, students should determine whether each sample is from a living organism.

Follow-up Activity: *Plant Cell vs. Animal Cell - Studio*
Follow-up Activity: *Unicellular vs. Multicellular Organisms - Studio*
Differentiation

- Group students heterogeneously to allow students with a strong command of the English language to assist in reading or interpreting questions
- Provide paper copies of diagrams for students to use as a reference
- Provide a handout with a list of vocabulary terms and definitions that will appear in the activity
- Allow students to provide answers that are handwritten, typed, or verbal
- Give students a variety of presentation styles to choose from (using charts/graphs, PowerPoint, making 3D presentations, creating videos/movies, making posters)
- Have students work as partners or in small groups (younger children could partner with older buddies)
- Enrichment: Students could change an additional variable in the activity and look for patterns
- Enrichment: Students could find real-world problems involving the concept and design solutions to those problems
- Enrichment: Students could research similar topics and create presentations
- Enrichment: Students could build a model of a key concept

Resources

https://www.khanacademy.org/science/biology/structure-of-a-cell/introduction-to-cells/a/intro-to-cells