

RESOURCE LIBRARY | ACTIVITY : 1 HR

Deep Dive into the Cell

Students explore the smallest level of organization of the human body: the cell. They compare plant and animal cells by examining infographics that illustrate cell structures and relating them to organism functions.

GRADES

5 - 8

SUBJECTS

Biology

CONTENTS

2 PDFs, 2 Resources

OVERVIEW

Students explore the smallest level of organization of the human body: the cell. They compare plant and animal cells by examining infographics that illustrate cell structures and relating them to organism functions.

For the complete activity with media resources, visit:

<http://www.nationalgeographic.org/activity/deep-dive-cell/>

In collaboration with



DIRECTIONS

1. Project two visualizations to show the smallest level of organization of the human body: the cell.

- Show the [Cell Size and Scale](#) interactive to portray the small scale at which cells exist.
- Then show the [Animal Cell infographic](#) and give students some time to orient to the details and features of the cell.
- Have students make connections to microbes by asking them to share their initial observations about the features of an animal cell.
 - Ask: *What do you notice? What does this remind you of? How does it relate to the microbes you learned about in the Introduction to Microbes and Human Body Systems and Microbes Across the Tree of Life activities?* (Possible responses: Many of the microbes were single-celled organisms. Some microbes that we learned about were microscopic animals, but others had simpler cell organization, such as bacteria.)
- Prompt students to make connections that the cell itself is a complex system, similar to the body systems they learned about in [Interconnected Systems of the Human Body](#) activity, just at a different scale. Point out that single-celled microbes carry out all the activities of life that humans do (with the exception of viruses, which are not comprised of cells and can only survive and multiply within living organisms).

2. Use infographics to compare features of plant and animal cells.

- Distribute the Deep Dive into the Cell Investigation Guide; explain that this organizer will help students track their learning during this activity.
- Have students access the [Plant Cell](#) infographic and [Animal Cell](#) infographic on computers or distribute printed handouts. Ask students to use the table in Part A of the Investigation Guide to record the cell structures, their locations, functions, and which type of cell they are found in.
- Then follow the steps below to have students identify and discuss the common features that the two cell types share and that are distinct.
- Cells are the smallest functional units of life in all organisms. Ask students: *Do all cells look the same? Which structures might be the same in both a plant and an animal cell? Which might be different?*
 - Have students read and discuss the [Plant Cell](#) and [Animal Cell](#) infographics. In pairs, have students create a Venn Diagram (or use the one [provided](#)) comparing and contrasting the two types of cells. When finished, have student discuss their findings as a class, summarizing the similarities and differences noted.

- Ask students: *How do cell structures relate to their function?* (One example of this is that plant cells have chloroplasts that allow them to perform photosynthesis for energy, but animal cells do not have chloroplasts since they get their energy elsewhere.)
- After discussing the similarities and differences between plant and animal cells, have students complete the synthesis question at the end of Part A. Tell them:
 - *Write a claim about how the plant cell's additional organelles help it to function. Support your claim with evidence from what you know about plants and their unique abilities.* (Possible claims: Cell wall provides additional structure for a plant, chloroplasts are needed to photosynthesize, larger vacuole stores liquid and helps to maintain cell structure.)

3. Conduct an investigation to compare different types of cells and a nonliving item.

- Introduce the lab and review the lab procedures, as detailed in Part B of the Investigation Guide. If you have selected specific nonliving items for students to choose from in the third part of the investigation, present those at this time.
- Review safety protocols for carrying out lab investigations. None of the chemicals or procedures in the lab investigation are dangerous, but students should use caution when swabbing their cheek with a toothpick and when using the microscopes.
- Distribute materials and have students complete the lab investigation in the same partner groups as in Step 2.
- During the lab, circulate to support students in using the lab tools as well as accurately viewing and interpreting their view of the items under the microscope.
- At the conclusion of the lab, students should respond to the synthesis questions in their Investigation Guide.

4. Lead a discussion to debrief and ensure students' understanding of the previous activities.

- Elicit students' responses to the synthesis questions in Part A and B from the Investigation Guide. Build on students' ideas as you facilitate a debrief discussion about the key features and functions of cell organelles, important differences between plant and animal cells, and how their investigation provided evidence that living things are made up of cells.

5. Revise Human Body Microbial Maps in original small groups for students to reflect on their learning and add in new understanding about cells.

- Encourage students to use their Investigation Guide to draw from what they just learned about cells as the smallest organizational structure of human bodies as they add more details to their maps.
- Prompt students to consider:
 - How to draw the relative scale between the different levels of body organization to show details on cells. For example, a “zoom in” circle similar to the view through a microscope.
 - How the microbes that students have already drawn on their body maps may interact with the cells of the body. Encourage students to use arrows or other symbols to make clear their ideas about which organizational level(s) (cells, tissues, organs, systems) of the body the microbe affects.

Modification

Step 1: If following the Misunderstood Microbes unit, you will revisit the [Cell Size & Scale](#) interactive in the Helpful Microbes activity to show the scale of other types of microbes that are smaller than a cell, but you may choose to show this now.

OBJECTIVES

Subjects & Disciplines

Biology

Learning Objectives

Students will:

- Apply their understanding of cells by revising their Human Body Microbial Maps.

Teaching Approach

- Project-based learning

Teaching Methods

- Lab procedures
- Multimedia instruction
- Writing

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
 - Information, Media, and Technology Skills
 - Information, Communications, and Technology Literacy
 - Learning and Innovation Skills
 - Critical Thinking and Problem Solving
- Science and Engineering Practices
 - Engaging in argument from evidence
 - Planning and carrying out investigations

National Standards, Principles, and Practices

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

- CCSS.ELA-LITERACY.RST.6-8.3:

Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

- CCSS.ELA-LITERACY.RST.6-8.7:

Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

NEXT GENERATION SCIENCE STANDARDS

- From Molecules to Organisms: Structures and Processes:

MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

• **MS. From Molecules to Organisms: Structures and Processes:**

MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

Preparation

What You'll Need

MATERIALS YOU PROVIDE

- Bromothymol blue (BTB) (less than 1 cup per group of four students)
- Compound/Light Microscope
- Droppers
- Iodine
- Microscope Slide Covers
- Microscope Slides
- Toothpicks

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per classroom, Color printer, Printer, Projector

PHYSICAL SPACE

- Classroom

SETUP

Prepare the materials for the cell investigation in Step 4. Additionally, it may be helpful to choose small, nonliving items for students to have options to investigate, such as pebbles, rubber erasers, pushpins, toothpicks, seashells (which are made by living organisms but do not have cells).

GROUPING

- Large-group instruction

- Small-group learning

BACKGROUND & VOCABULARY

Background Information

Cells are the smallest level of organization of the human body, as well as other multicellular organisms. The features and structure of cells differ widely between eukaryotic organisms such as plants and animals, which differ from microbial organisms such as bacteria and archaea. These structural differences have implications for how the cells/organism functions. Nonliving organisms do not have cells, which is a key feature that distinguishes them from living organisms.

Prior Knowledge

["Systems thinking at different scales", "Interrelation of structure and function"]

Recommended Prior Activities

- [Introduction to Microbes and Human Body Systems](#)
- [Microbes Across the Tree of Life](#)
- [The Interconnected Systems of the Human Body](#)

Vocabulary

Term	Part of Speech	Definition
cell	<i>noun</i>	smallest working part of a living organism.
function	<i>verb</i>	to work or work correctly.
multicellular	<i>adjective</i>	composed of more than one cell.
organelle	<i>noun</i>	specialized part of a cell that performs a specific function.
photosynthesis	<i>noun</i>	process by which plants turn water, sunlight, and carbon dioxide into water, oxygen, and simple sugars.
scale	<i>noun</i>	distinctive relative size, extent, or degree.
single-celled	<i>adjective</i>	having or consisting of a single cell (also referred to as unicellular).
structure	<i>noun</i>	system of organization.
unicellular	<i>adjective</i>	having one cell.

For Further Exploration

Articles & Profiles

- [Arizona State University: Ask a Biologist: How Many Types of Cells Are in the Human Body?](#)



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