7.L.1.2 - Compare the structures and functions of plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, chloroplasts, mitochondria, and vacuoles).
Table of Contents Update

Label your table of contents. We will use headings and subheadings for our new section.

Heading - 7.L.1.2. - Structures and Life Functions of Plant and Animal Cells

Subheading (indent) - Vocabulary
Vocabulary

- **Cell**: The basic units of structure and function in living things.
- **Cell Theory**: States that all living things are composed of cells.
- **Virus**: A small, nonliving particle that invades and then reproduces inside a living cell.
- **Cellular respiration**: Is the process in which cells break down food and release the energy stored.
- **ATP**: Adenosine triphosphate, or ATP for short, is the energy currency of life; it is a high energy molecule found in every cell and its job is to store and supply the cell with needed energy.
Let’s Engage Your Brain

Functions of Living Things Assessment Probe
What do you think?

<table>
<thead>
<tr>
<th>Functions of Living Things</th>
</tr>
</thead>
<tbody>
<tr>
<td>The functions listed below are performed by living organisms. Which functions are performed by plants, animals, or both? Mark each example with a P, A, or B.</td>
</tr>
<tr>
<td>Put a P in front of the functions performed <strong>only</strong> by plants.</td>
</tr>
<tr>
<td>Put an A in front of the functions performed <strong>only</strong> by animals.</td>
</tr>
<tr>
<td>Put a B in front of the functions performed <strong>by both</strong> plant and animals.</td>
</tr>
</tbody>
</table>

- Photosynthesis (make their food) |
- Acquire and take in food from the environment |
- Respiration (release energy from food) |
- Cell division |
- Reproduction |
- Growth |
- Elimination of waste products |
- Storage of energy |
- Transport of materials within the organism |
- Maintain a stable, internal environment |
- Response to stimuli |
- Repair of damaged structures |

Explain your thinking. What helped you decide whether a function is performed by a plant, animal, or both?
Table of Contents Update

Label your table of contents. We will use headings and subheadings for our new section.

Heading - 7.L.1.2. - Structures and Life Functions of Plant and Animal Cells

Subheading (indent) - Cell Theory
Development of the Cell Theory

Who developed the cell theory?
Three German Scientists between 1838-1855
- Theodor Schwann
- Matthias Schleiden
- Rudolf Virchow
Development of the Cell Theory

What was Theodor Schwann’s conclusion? In 1839, he concluded that all animals are made of cells. Thus, stated that all living things are made up of cells.
Development of the Cell Theory

What was Matthias Schleiden’s conclusion? In 1838, he concluded that all plants are made of cells. This was based on his research and that of others.
What did Rudolf Virchow contribute? In 1855, he reasoned that new cells are formed only from cells that already exist. “All cells come from cells,” wrote Virchow as he observed cells dividing under a microscope.
Cell Theory

What is the cell theory?
Widely accepted explanation of the relationship between cells and living things.
It states the following:
- All living things are composed of cells.
- Cells are the basic unit of structure and function in living things.
- All cells are produced from other cells.
Cell Theory

Cell size is limited.

- As cell size increases, it takes longer for material to diffuse from the cell membrane to the interior of the cell.

**Surface area-to-volume ratio**: as a cell increases in size, the volume increases 10x faster than the surface area.
When does the theory hold true?

- The cell theory holds true no matter how **big** or **small** a living thing is.
What are cells?

All living things are made of one or more cells. A cell is a membrane-covered structure that contains all of the materials necessary for life. Cells are the smallest unit of life, which means they are the smallest structures that can perform life functions.

Information obtained from Science Fusion - The Diversity of Living Things - Chapter 1, Lesson 1
A change that affects the activity of an organism is called a stimulus (plural: stimuli). A stimulus can be gravity, light, sound, a chemical, hunger, or anything else that causes an organism to respond in some way. For example, when your pupils are exposed to light - a stimulus - they become smaller - a response.

Even though an organism’s outside environment may change, conditions inside its body must stay relatively constant. Many chemical reactions keep an organism alive. These reactions can only happen when conditions are exactly right. An organism must maintain stable internal conditions to survive. The maintenance of a stable internal environment is called homeostasis. Your body maintains homeostasis by sweating when it gets hot or shivering when it gets cold. These keep the body at a stable internal temperature.
Go to your table of contents. We will continue using subheadings.

Locate the heading - 7.L.1.2. - Structures and Life Functions of Plant and Animal Cells

New subheading (indent) - Cell Diagrams and Organelles Chart
Looking Inside Cells
Section 2
Table of Contents Update

Go to your table of contents. We will continue using subheadings.

Locate the heading - 7.L.1.2. - Structures and Life Functions of Plant and Animal Cells

New subheading (indent) - Plant Cells
Plant cells

Cork cell

Elodea cells

Onion cell
Plant Cell

Cell Wall
In a plant cell, a stiff wall surrounds the membrane, giving the cell a rigid, boxlike shape.

Chloroplasts
These organelles capture energy from sunlight and use it to produce food for the cell.

Vacuole
Most mature plant cells have one large vacuole. This sac within the cytoplasm stores water, food, waste products, and other materials.

Endoplasmic Reticulum
This network of passageways carries materials from one part of the cell to another.

Nucleus
The nucleus directs all of the cell’s activities, including reproduction.

Cytoplasm
Ribosomes
Golgi Body
Mitochondrion
Cell Membrane
The cell membrane protects the cell and regulates what substances enter and leave the cell.
Plant cell:

- Cytoplasm
- Vacuole
- Cell Wall
- Cell Membrane
- Chloroplast
- Nucleus
- Mitochondria
- Golgi Body
- Ribosome
- Endoplasmic Reticulum
Eukaryotic Cell Organelles and Function

**Cell Wall**

- **Function:** provides support and protection to the cell membrane
- Made of porous cellulose so it does not regulate what enters and leaves, fungal walls (chitin)
- **Located:** Found outside the cell membrane in plant cells
Eukaryotic Cell Organelles and Function

Cell Membrane

- **Functions:**
  - Separates the inside of the cell from its environment, provides support and protection
  - Controls what substances enter and leave the cell
    - Oxygen, carbon dioxide, wastes, food, etc...
- **Structure:**
  - Lipid bilayer with embedded proteins
- **Located:**
  - In plant cells, it is to the inside of the cell wall
  - In animal cells, it is the outermost part of the cell
Eukaryotic Cell Organelles and Function

Nucleus

- **Nickname:** “The Control Center” - directs all activities in the cell
- **Function:** holds the DNA
- **Parts:**
  - **Chromatin:** strands that contain genetic material, the instructions for directing the cell’s function.
  - **Nucleolus:** dark spot in the middle of the nucleus that helps make ribosomes
  - **Nuclear Envelope:** surrounds nucleus, protects, composed of 2 phospholipid bilayers

**Location**
- Plant and animal cells
Eukaryotic Cells

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Eukaryotic Cell Organelles and Function

**Cytoplasm**

- **Nickname:** “Cytosol” - clear thick jellylike material
- **Function:** supports and protects cell organelles
- **Parts:**
  - Organelles found in cell membrane.
  - Contains the cytoskeleton fibers.

**Location**
- Plant and animal cells
Cytoskeleton

- network of protein fibers found in all eukaryotic cells
- supports the shape of the cell
- keeps organelles in fixed locations
- helps move materials within the cell

Cytoskeleton fibers include:
- actin filaments – responsible for cellular contractions, crawling, “pinching”
- Microtubules - provide organization to the cell and move materials within the cell
- intermediate filaments – provide structural stability
Eukaryotic Cell Organelles and Function

**Chloroplasts**

- **Function**: traps energy from the sun and uses it to produce food for the plant cell
- **Located**: Cytoplasm
- Green in color because of chlorophyll, which is a green pigment
- Plant cells
Chloroplasts

- organelles present in cells of plants and some other eukaryotes
- contain chlorophyll for photosynthesis
- surrounded by 2 membranes
- **thylakoids** are membranous sacs within the inner membrane
- **grana** are stacks of thylakoids
Chloroplasts
Eukaryotic Cell Organelles and Function

Mitochondria

- **Nickname:** “The Powerhouse”, rod-shaped structures
- **Function:** Energy formation
  - Breaks down food to make ATP
    - ATP: is the major fuel for all cell activities that require energy. Converts energy in food molecules to energy the cell can use to carry out its functions.
- **Located:** Cytoplasm
  Plant and animal cells
Mitochondria

- surrounded by 2 membranes
  - smooth outer membrane
  - folded inner membrane with layers called **cristae**
- **matrix** is within the inner membrane
- **intermembrane space** is located between the two membranes
- contain their own DNA
Eukaryotic Cell Organelles and Function

**Ribosomes**

- **Function:** Factories that produce proteins and transports to Golgi bodies from endoplasmic reticulum
- composed of ribosomal RNA and proteins, grainlike in appearance
- Found in all cells, prokaryotic and eukaryotic
- **Located:** cytosol of the cytoplasm and attached to internal membranes, endoplasmic reticulum
Investigating Plant Cells

Today you will use the link below to visit a website to research plant cells. In your INB, you will need to make sure your diagram and chart are completed. You will be able to find all of this information on the website listed below.

Cells Alive! Plant Cell Exploration
PLANT CELL
QUIZ
BOWL

Show What You Know!
QUIZ BOWL DIRECTIONS

On the following slides are the questions from the quiz you just took. Your job is to work with your team to get the correct answer first. All teams must answer the question.

The team that answered the question correctly first has an opportunity to gain a point by justifying their selection based on the notes from your INB about plant cells. However, if your team does not adequately answer the question, you lose a point and the next team has a chance to earn a point.
Show What You Know!

The place where photosynthesis in eukaryotes takes place:

a. ATP
b. cellular respiration
c. chloroplast
d. mitochondria
Show What You Know!

The cell organelle that transports materials needed to make proteins is the?

a. mitochondria
b. ribosomes
c. chloroplast
d. Endoplasmic Reticulum ER
Show What You Know!

The cell organelles that produce energy from food for the cell is the?

a. mitochondria
b. Golgi Apparatus / Body
c. cell walls
d. ribosomes
Show What You Know!

What organelle converts sunlight into sugar and energy for a plant?

a. cytoplasm
b. chloroplast
c. lysosomes
d. cell membrane
Show What You Know!

Which part of the cell allows nutrients and other materials to enter or leave the cell?

a. cell membrane
b. chloroplast
c. cytoplasm
d. nucleus
Go to your table of contents. We will continue using subheadings.

Locate the heading - 7.L.1.2. - Structures and Life Functions of Plant and Animal Cells

New subheading (indent) - Animal Cells
Animal Cells

Frog blood cells

Cheek Cells

Blood cells
All About Animal Cells

Let’s start with this video about Animal Cells.
Cytoplasm: The cytoplasm includes a gel-like fluid in which many different organelles are found.

Ribosomes: These small structures function as factories to produce proteins. Ribosomes may be attached to the endoplasmic reticulum, or they may float in the cytoplasm.

Nucleus: The nucleus directs all of the cell’s activities, including reproduction.

Mitochondria: Most of the cell’s energy is produced within these rod-shaped organelles.

Endoplasmic Reticulum: The Golgi bodies receive materials from the endoplasmic reticulum and send them to other parts of the cell. They also release materials outside the cell.

Golgi Body: The Golgi bodies receive materials from the endoplasmic reticulum and send them to other parts of the cell. They also release materials outside the cell.

Lysosomes: These small organelles contain chemicals that break down food particles and worn-out cell parts.

Vacuole: Some animal cells have vacuoles that store food, water, waste, and other materials.

Cell Membrane: Since an animal cell does not have a cell wall, the cell membrane forms a barrier between the cytoplasm and the environment outside the cell.
Animal cell:

- Mitochondria
- Nucleus
- Golgi Body
- Cytoplasm
- Endoplasmic Reticulum
- Ribosomes
- Cell Membrane
Eukaryotic Cell Organelles and Function

**Endoplasmic Reticulum (ER)**
- **Nickname**: “Roads”
- **Function**: The internal delivery system of the cell, passageways that carry proteins and other materials from one part of the cell to another.
- **Located**: Cytoplasm
  Plant and animal cells
Endomembrane System

Rough endoplasmic reticulum (RER)

- membranes that create a network of channels throughout the cytoplasm
- attachment of ribosomes to the membrane gives a rough appearance
- synthesis of proteins to be secreted, sent to lysosomes or plasma membrane
Endomembrane System

Smooth endoplasmic reticulum (SER)
- relatively few ribosomes attached
- functions:
  - synthesis of membrane lipids
  - calcium storage
  - detoxification of foreign substances
Three-Dimensional Endoplasmic Reticulum

- Nuclear envelope
- Nucleus
- Ribosomes
- Rough endoplasmic reticulum
- Smooth endoplasmic reticulum
Eukaryotic Cell Organelles and Function

**Lysosomes**: circular, but bigger than ribosomes)
- **Nickname**: “Clean-up Crews”, small round structures
- **Function**: to break down food into particles the rest of the cell can use and to destroy old cells by phagocytosis, Contain chemicals that break down certain materials in the cell (macromolecules).
- **Located**: Cytoplasm
  Plant and animal cells
Eukaryotic Cell Organelles and Function

**Vacuoles**

- **Function:**
  - Plant Cells
    - Very large
    - stores material needed by the cell (water)
    - This is what makes lettuce crisp
    - When there is no water, the plant wilts
  - Animal Cells
    - Smaller than in plant cells
    - Stores materials needed by cell/releases waste products
    - used in cellular digestion
- **Located:** Cytoplasm
Eukaryotic Cell Organelles and Function

Golgi Body/Apparatus

- **Nickname:** The shippers
- **Function:** Receive proteins and other newly formed materials from the Endoplasmic Reticulum, packages, modifies, and transports materials to different locations inside/outside of the cell
- **Appearance:** Flatten stacks of interconnected membranes (pancakes)
- **Located:** Cytoplasm
  - Plant and animal cells
1. Vesicle containing proteins buds from the rough endoplasmic reticulum, diffuses through the cell, and fuses to the cis face of the Golgi apparatus.

2. The proteins are modified and packaged into vesicles for transport.

3. The vesicle may travel to the plasma membrane, releasing its contents to the extracellular environment.
<table>
<thead>
<tr>
<th>EXTERIOR STRUCTURES</th>
<th>Prokaryote</th>
<th>Animal</th>
<th>Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell wall</td>
<td>Present (protein-polysaccharide)</td>
<td>Absent</td>
<td>Present (cellulose)</td>
</tr>
<tr>
<td>Cell membrane</td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Flagella/cilia</td>
<td>Flagella may be present</td>
<td>May be present (9 + 2 structure)</td>
<td>Absent except in sperm of a few species (9 + 2 structure)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INTERIOR STRUCTURES</th>
<th>Prokaryote</th>
<th>Animal</th>
<th>Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>ER</td>
<td>Absent</td>
<td>Usually present</td>
<td>Usually present</td>
</tr>
<tr>
<td>Ribosomes</td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Microtubules</td>
<td>Absent</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Centrioles</td>
<td>Absent</td>
<td>Present</td>
<td>Absent</td>
</tr>
<tr>
<td>Golgi apparatus</td>
<td>Absent</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Nucleus</td>
<td>Absent</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Mitochondria</td>
<td>Absent</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Chloroplasts</td>
<td>Absent</td>
<td>Absent</td>
<td>Present</td>
</tr>
<tr>
<td>Chromosomes</td>
<td>A single circle of DNA</td>
<td>Multiple; DNA–protein complex</td>
<td>Multiple; DNA–protein complex</td>
</tr>
<tr>
<td>Lysosomes</td>
<td>Absent</td>
<td>Usually present</td>
<td>Present</td>
</tr>
<tr>
<td>Vacuoles</td>
<td>Absent</td>
<td>Absent or small</td>
<td>Usually a large single vacuole</td>
</tr>
</tbody>
</table>
Investigating Animal Cells

Today you will use the link below to visit a website to research animal cells. In your INB, you will need to make sure your diagram and chart are completed. You will be able to find all of this information on the website listed below.

Cells Alive! Animal Cell Exploration
Cell Energy, Photosynthesis, Cellular Respiration, and Fermentation

Cell Energy, Photosynthesis, and Cellular Respiration Video

Fermentation Overview Video
Let's Review

Cells, Cells Video
ANIMAL CELL
QUIZ
BOWL

Show What You Know!
Show What You Know!

In animal cells the organelle called a ____________ that breaks down waste material in a cell.

a. nucleus
b. lysosomes
c. Golgi apparatus / body
d. central vacuole
Show What You Know!

These are structures inside of a cell that perform all of the functions of life for the cell

a. DNA
b. a cell wall
c. a tissue
d. an organelle
Show What You Know!

The organelle that processes proteins and turns them into things and then it sends it out to the cell is called the?

a. mitochondria
b. Chloroplast
c. ribosomes
d. Golgi apparatus
Show What You Know!

Eukaryotic cells do have

a. cytoplasm

b. nucleus

c. organelles

d. All of the above
Show What You Know!

Where are organelles found in a eukaryotic cell?

a. cytoplasm
b. endoplasmic reticulum
c. chloroplast
d. cell wall
Go to your table of contents. We will continue using subheadings.

Locate the heading - 7.L.1.2. - Structures and Life Functions of Plant and Animal Cells

New subheading (indent) - Cell Energy, Photosynthesis, Cellular Respiration