

Science Standard of Learning 5.5- Life Science

The student will investigate and understand that organisms are made of one or more cells and have distinguishing characteristics that play a vital role in the organism's ability to survive and thrive in its environment. Key concepts include:

- a. basic cell structures and functions;
- b. classification of organisms using physical characteristics, body structure and the behavior of the organism;
- c. traits of organisms that allow them to survive in their environment

Learning Targets

- The student will be able to classify organisms based on their distinguishing characteristics, physical characteristic, body structure and behavior of the organism.
- Students will be able to differentiate between a plant and an animal cell and describe why their cell structures are different.
- Student will be able to identify the traits of organisms that allow them to survive in their environment.

Hey! What's the BIG IDEA???

- All living things are made of cells with different structures and functions which allow them to survive in their environment.

Essential Questions

- How and why do scientists classify organisms into different categories?
- How are cells of various organisms alike and how are they different?
- What are the functions of the basic animal and plant cell structures?
- How do specific traits of an organism allow it to survive in its environment?

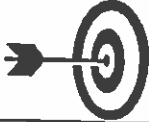
GOALS: By the end of this section, I should be able to:

Draw, label, and describe the essential structures and functions of plant and animal cells. For plants, include the terms nucleus, cell wall, cell membrane, vacuole, chloroplasts, and cytoplasm. For animals, include nucleus, cell membrane, vacuole, and cytoplasm. Design an investigation to make observations of cells.

Compare and contrast plant and animal cells and identify their major parts and functions.

Science Standard of Learning 5.5- a. basic cell structures and functions

Learning Target- How will I know if I've met my goal?

<p>5.5a The student will investigate and understand that organisms are made of cells and have distinguishing characteristics, including basic cell structures and functions</p>	<p>Most of the time, the student is able to compare and contrast plant and animal cells, and identify their major parts and functions</p>	<p>Much of the time, the student is able to compare and contrast plant and animal cells, and identify their major parts and functions</p> 	<p>Some of the time, or with assistance, the student is able to compare and contrast plant and animal cells, and identify their major parts and functions</p>	<p>Even with assistance, the student is unable to compare and contrast plant and animal cells, and identify their major parts and functions</p>
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Why should we learn about cells?

Studying cells helps us understand how organisms, including humans, function. After all, our bodies are made up of trillions of cells. By learning about cells, we come to understand how we can

- protect cells to prevent infection and other harmful effects
- observe cells to diagnose disease
- treat cells to heal illnesses
- stop harming cells through our choices and actions

So, why are cells so important?

Cells are one of the most important things on Earth. Without cells, organisms would not exist. In any living organism, cells are the things that help the organism function and survive. Some organisms only have one cell (**unicellular** organisms- the prefix *uni* means "one"- as in unicycle (one wheel), unicorn (mythical creature with one horn))- the cell literally is the organism. In organisms with many cells (**multicellular** organisms, prefix *multi* means many or multiple), different types of cells have different jobs that help the organism survive.

The cells in a multicellular organism work together to complete tasks within the body. These cells working together are called **tissues**. These tissues work with one another to carry out a specific function and combine to make **organs**. When many organs are working to do the same thing within a body, these organs become an organ system. The organism is able to survive due to all of these organ systems functioning to make that organism work right.

There are hundreds of different types of cells in your body. These cells work together to take care of the organism they belong to. Here are a few types of cells humans have and their functions:

Bone cells- help give your body shape. When you break a bone, your bone cells remove damaged cells and replace them with new bone cells to fill in the break. This helps the new bone be as strong as it was before it broke.

Skin cells- group together to protect your body (like armor) and produce vitamin D. Your skin is made up of many layers of skin cells, the outermost layer is comprised of dead cells.

Nerve cells- these cells use chemical and electrical signals to send and store information.

Muscle cells- help your body to move.

Animals and plants look really different, so their cells must be really different-right?

WRONG!!! Even though animals and plants look very different, down at the cellular level, they have a lot of the same structures and parts, called organelles. Let's learn more!

Cell Parts and Their Functions

Organism: any living thing, such as a plant, animal, fungus, yeast, or bacterium

Cell: The cell is the smallest unit of life.

- There are lots of different types of cells. Each type of cell is different and performs a different function.
- Some organisms are unicellular (only one cell) and others have many cells (humans have about 10 TRILLION cells)
- Most are microscopic (can only be seen through a microscope)

Nucleus: the "control center" of the cell

- Large oval body near the center of the cell
- Surrounded by a nuclear membrane
- Contains genetic material →
- CHROMOSOMES (DNA)



Chromosomes

- Long pieces of DNA found in the nucleus of cells
- DNA is the material that holds genes
- Considered the building block of the human body

Genes

- Parts of DNA
- Carry hereditary information passed from parents to children- Brown eyes or blue? Dark or light hair?



Think of a nucleus as being like the principal's office, where all of the plans for the school are kept

Cell Membrane: the outside layer of a cell that controls what goes in and out of a cell

- Separates the cell from other cells
- Is porous (has small holes) → allows molecules to pass through.
- Keeps the contents of the cell in and harmful things, like viruses, out of the cell



Think of a cell membrane as being a very floppy version of the walls, windows, and doors of a school

Cell Wall (Plant Cells Only!): a thick, strong layer that runs outside the membrane of a plant cell that provides extra support

- Protects + supports the cell
- Made up of a tough fiber called cellulose
- Helps give the plant cell its distinct rectangular shape
- Bonds with other cell walls to form the structure of the plant



Think of a cell wall as being a brick wall around the school

Think of cytoplasm as being the air in school, surrounding everyone and everything

Cytoplasm: the fluid inside of a cell

- Cell material outside the nucleus but within the cell membrane
- Clear, jelly-like thick fluid
- Contains structures called organelles

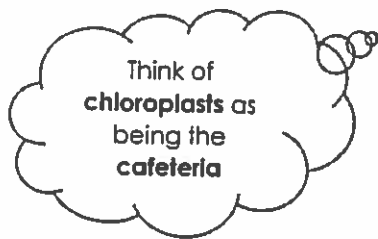


Vacuoles: the part of a cell that stores food, water, and waste

- Cells need food and water, too! Vacuoles are clear fluid sacs that act as storage areas for food, minerals, and waste.
- In plant cells, they have only one large vacuole that is mostly filled with water. This gives the plant support.
- In animal cells the vacuoles are much smaller.

Think of vacuoles as being the fridge and trash cans in school





Chloroplasts (Plant cells only): a plant cell part where photosynthesis happens, using sunlight to convert air and water into sugar

- Contains a green pigment known as chlorophyll, which is important for photosynthesis.
- Enables plant cells to make their own food- animal cells can't do that!

Chlorophyll

- A molecule that can use light energy from sunlight to turn water and carbon dioxide gas into sugar and oxygen (this process is called photosynthesis)
- Chlorophyll is magnesium based and is usually green.

Organelle: a structure within a cell that carries out specific functions to support the life of the cell

- Like the "organs" of a cell
- The different parts of the cell that have different functions
- Examples of organelles include nucleus, vacuoles, chloroplasts, and mitochondria
- Functions include
 - bringing in nutrients
 - removing wastes
 - generating and releasing energy for the cell to use
 - making substances that the cell needs
 - reproducing



Investigating Cells

Here is a sample investigation we can use to learn more about the cell structures of two organisms- an onion and human. As you read through the investigation, think of ways you could design your own investigation of cell structures in other organisms.

Materials: Microscope, onion, 2 plastic slides, iodine, 2 cover slips, eyedropper, swab

1. Peel apart the onion and break off a small piece (no bigger than a fingernail) of the thin, slimy, clear layer that coats the thicker slices of onion
2. Place the onion skin flat on the slide
3. Put a small drop of iodine on the onion skin. CAUTION- Iodine stains and is toxic if swallowed.
4. Wait 3 minutes for the iodine to stain the cells (the iodine helps to see the cells-otherwise they'd be too transparent to see)
5. Gently place a coverslip over the onion skin, then look at it under a microscope. Try the different settings to see what different things you can see. What organelles can you see?
6. After washing your hands, use a cotton swab to gently scrape cells from the inside of your cheek- you don't have to scrape hard. Repeat steps 2-5, then view the cells.
7. Draw and label a picture of the cells you have seen.

ANIMAL CELL

KEY

Nucleus

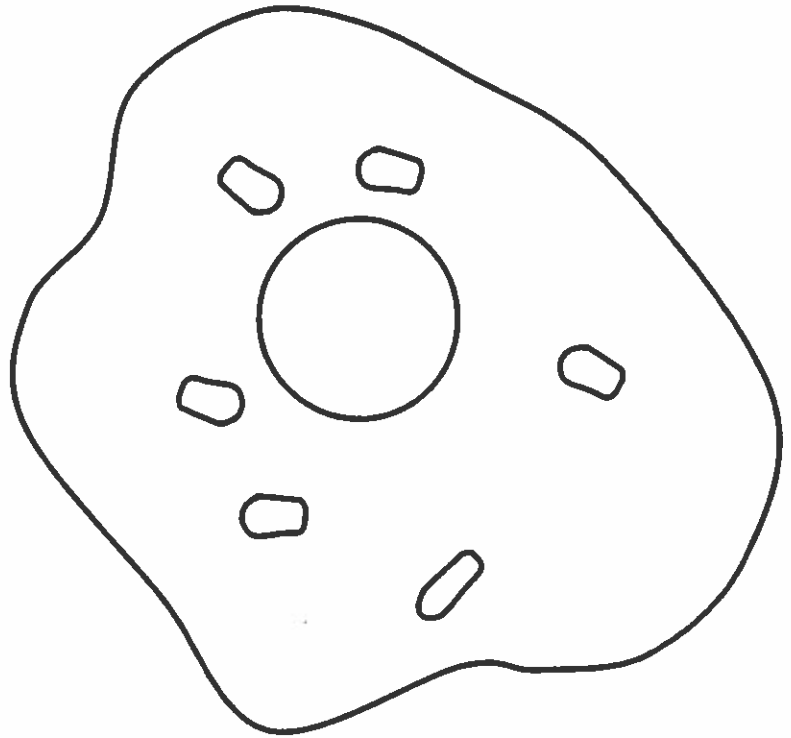
Cell Wall

Cell Membrane

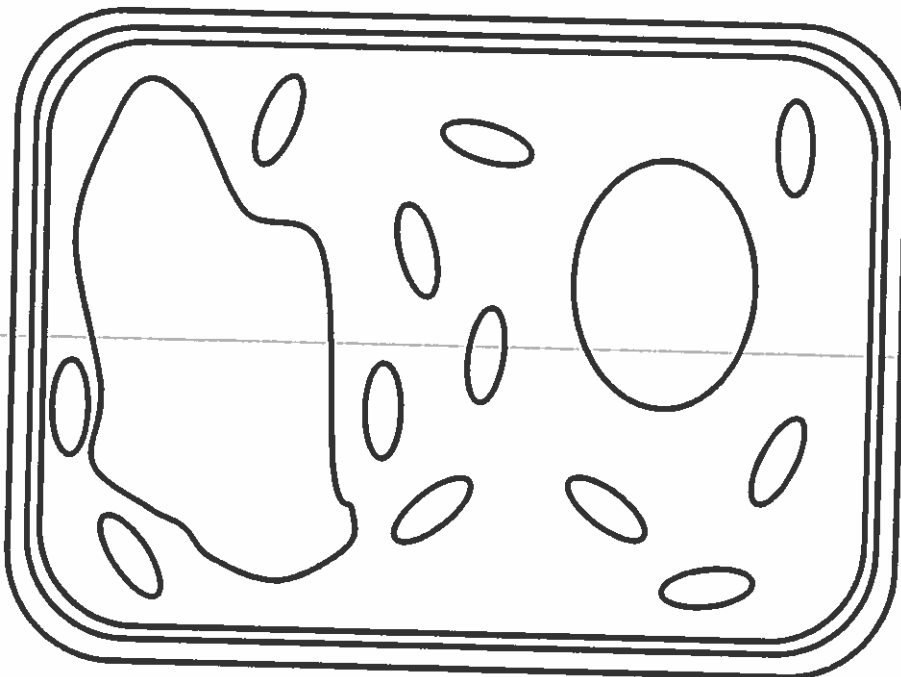
Vacuoles

Cytoplasm

Chloroplasts



PLANT CELL



Below, draw, label, and describe the essential structures and functions of a plant cell.

Include the following terms: *nucleus*, *cell wall*, *cell membrane*, *vacuole*, *chloroplasts*, and *cytoplasm*

Essential Question: What are the functions of the basic animal and plant cell structure?

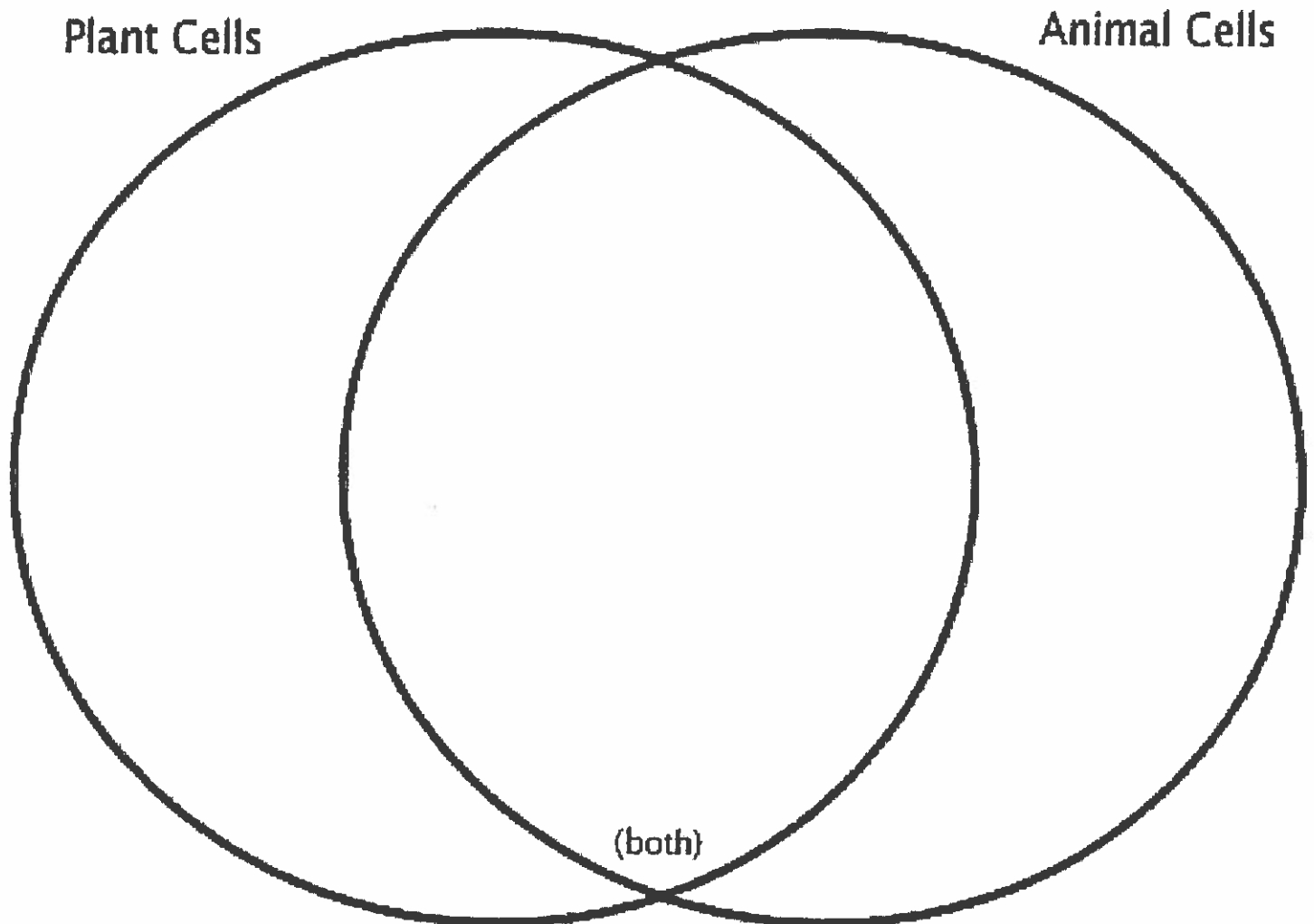
Below, draw, label, and describe the essential structures and functions of an animal cell.

Include the following terms: *nucleus*, *cell membrane*, *vacuole*, and *cytoplasm*

Essential Question: What are the functions of the basic animal and plant cell structure?

Compare and contrast the cell structures of plants and animals

Essential Question: How are cells of various organisms alike and how are they different?



Now that you've reviewed all of the important concepts, let's review our goals. Put a check next to each goal if you feel confident that you can answer the question or have achieved the target.

Students will be able to differentiate between a plant and an animal cell and describe why their cell structures are different.

How are cells of various organisms alike and how are they different?

What are the functions of the basic animal and plant cell structures?

Much of the time, I am able to compare and contrast plant and animal cells, and identify their major parts and functions