Lesson 3.1: Cell Structure and Function

Task	Page(s)	Learning Target
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2	3-7	I can use a simulation tool to compare relative sizes of cells and molecules.
3	8	I can identify animal cell **structures** and explain their **functions**.
4	9-10	I can make an analogy for cell parts to describe cell structures and/or functions.
5	11-12	I can create a model to represent the animal cell and critique models for strengths and limitations.
6	13-14	I can use household items to represent animal cell structures **and** functions.
7	15-17	I can present and analyze data on cell division.

Task 1 Learning Target: I can provide and explain evidence for Cell Theory.

1.There are three parts to *Cell Theory:*

a. All _____ things are made of one or more cells

b. The cell is the basic unit of life in which _____ occur

c. _____

d. What is cell division? How does cell division relate to cell theory?

e. How does Redi's experiment support cell theory? ***Read the text and watch the video below in order to answer this question.*

Where do living things come from? Living things come from other living things through reproduction. Four hundred years ago people believed that life could appear from nonliving material. For example, when people saw flies swarming around decaying meat, they concluded that flies were produced by rotting meat. The mistake that living things can arise from nonliving sources is called ***spontaneous generation***.
In the 1600s, an Italian doctor named Francesco Redi helped to disprove spontaneous generation. Redi designed a controlled experiment to show that maggots, which develop into new flies, do not arise from decaying meat.

Watch the following video:
http://www.sumanasinc.com/webcontent/animations/content/scientificmethod.html

Task 2 Learning Target: I can use a simulation tool to compare relative sizes of cells and molecules.

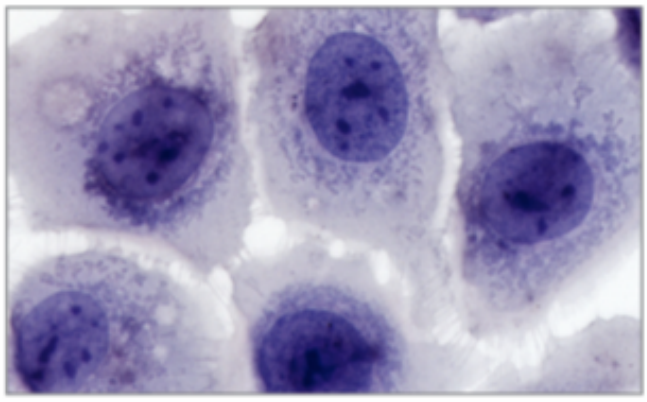
1. Sort the organisms and objects on the Scale Cards from smallest to largest.
   Remember to discuss your ideas as you work! Record your **Predictions** in the chart below:

Smallest Prediction: Actual Answer:	Prediction: Actual Answer:	Prediction: Actual Answer:	Prediction: Actual Answer:
Objects get larger ----------→			
Prediction: Actual Answer:	Prediction: Actual Answer:	Prediction: Actual Answer:	Prediction: Actual Answer:
Objects get larger ----------→			
Prediction: Actual Answer:	Prediction: Actual Answer:	Prediction: Actual Answer:	Prediction: Actual Answer:
Objects get larger ----------→			
Prediction: Actual Answer:	Prediction: Actual Answer:	Prediction: Actual Answer:	**Largest** Prediction: Actual Answer:

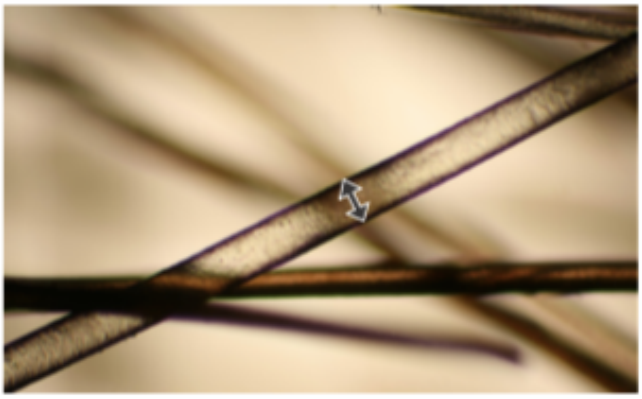
2. The images on the cards are not all printed at the same scale. That means that we cannot tell how big objects are in relation to one another just by looking at the images. Use the SCALE TOOL to get accurate evidence about the objects' sizes: https://apps.learning.amplify.com/scaletool/ Record the **Actual Answers** in your chart.

ant

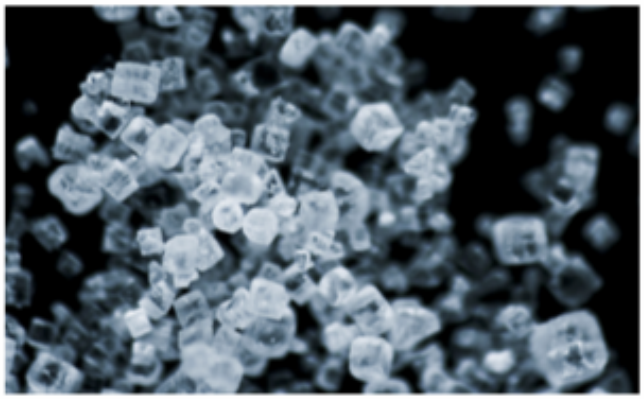
marble



human skin cells

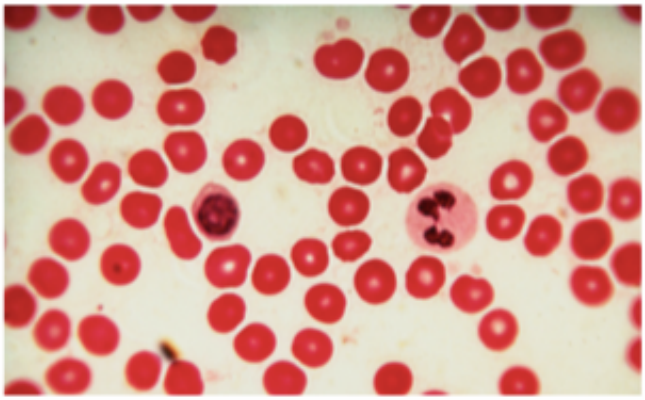


width of a human hair

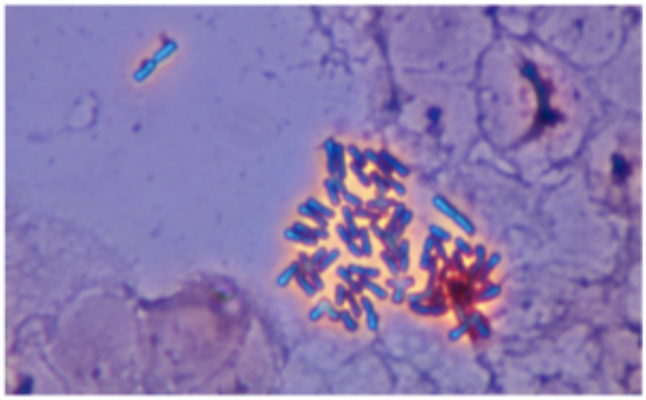


salt grains

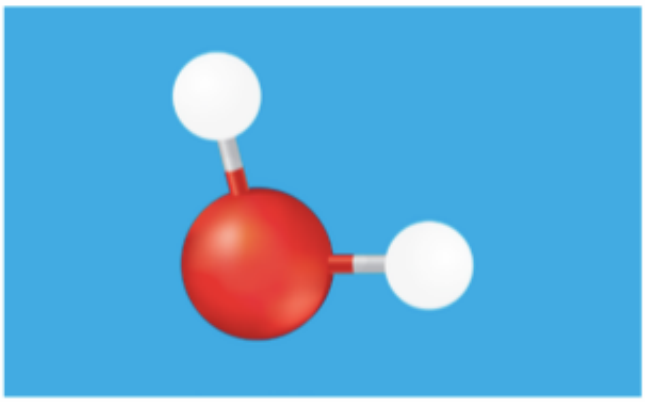
human



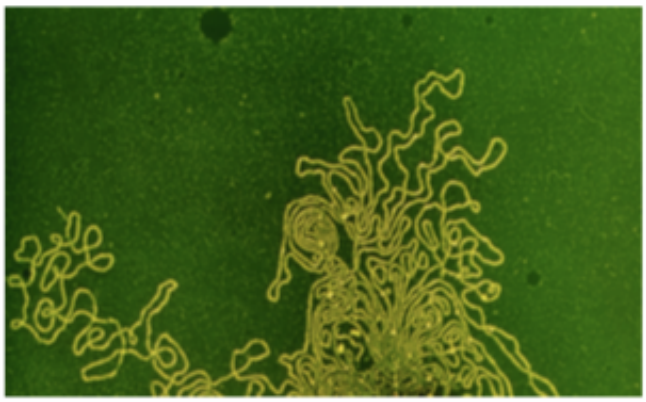
human blood cells



E. coli bacteria



water molecule



width of DNA strand

1 centimeter

1/100th of a meter

or

0.01 m

1 meter

microscopic:
cannot be seen with the naked eye

visible:
can be seen with the naked eye

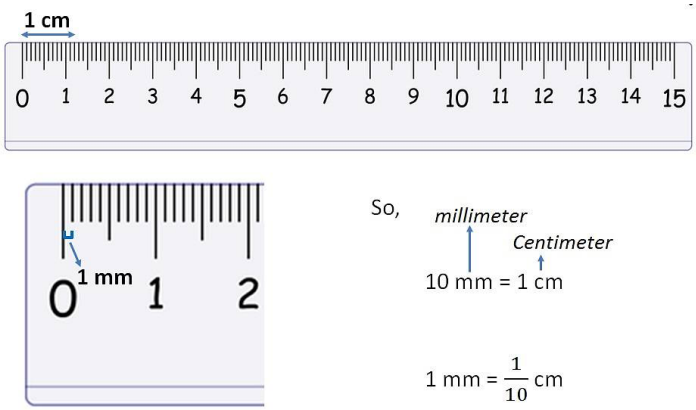
1 nanometer
1/100,000,000th of a meter
or
0.000000001 m

1 micrometer
1/1,000,000th of a meter
or
0.000001

1 millimeter
1/1,000th of a meter
or
0.001 m

Enrichment:

3. Microscopic things are really hard to imagine since we cannot see them with the naked eye. When life scientists study things that are too small to see, they often use a scale model. A scale model makes it easier to compare the sizes of microscopic things. Imagine dividing 1 millimeter into 1000 smaller pieces. One of those pieces is the size of a micrometer. A micrometer is 1/1000th of a millimeter.



Choose two of the following items: E.coli bacterium, red blood cell, or skin cell. Make a Scale Model of these microorganisms, where 2 centimeters = 1 micrometer. Label the name and size of each microorganism. This means your microorganisms will be drawn at 20,000 times their actual size.

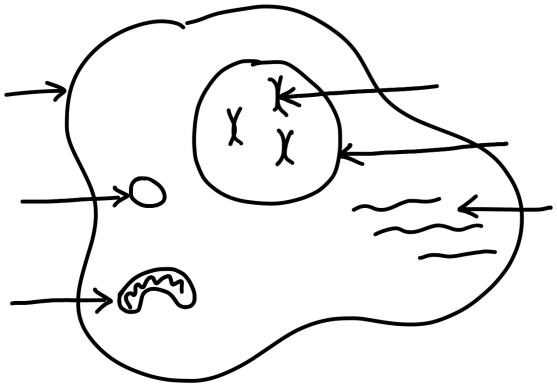
4. How might you represent a water molecule on your scale model?

5. Microorganisms are microscopic—they are so small that we cannot see just one or two of them with the naked eye. But, when there are millions or trillions, we can actually see them without a microscope. One way that scientists can observe microorganisms is by letting them multiply until the populations are big enough to see with the naked eye. This is called growing a culture. Research and draw a diagram to show how cultures are prepared.

Task 3 Learning Target: I can identify animal cell **structures** and explain their **functions**.
Video Links: https://sites.google.com/a/ps207tigers.org/207sci/cell-parts

1. Animal Cells

A. Draw and label an animal cell and its parts.



B. Define/Describe the STRUCTURE AND FUNCTION of the following:

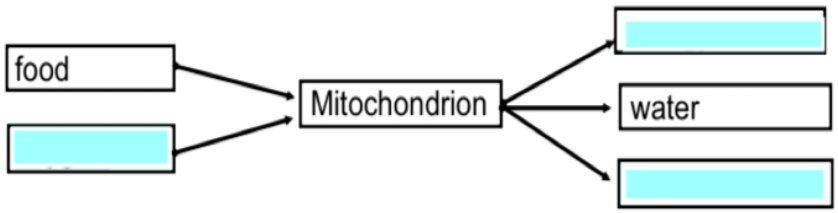
******SKIP LINES/LEAVE SPACE FOR ADDITIONAL NOTES**

	Structure (what does the cell part look like):	Function (what does the cell part do):
Cell membrane:		
Cytoplasm		
Vacuole		
Mitochondria		
Nucleus		
DNA		
Chromosomes		

C. Out of the cell parts in the table above, which ones are considered *organelles*? Explain.

2.Define **Cellular Respiration**: _____

**Copy and complete the following flow chart.



Task 4 Learning Target: I can make an analogy for cell parts to describe cell structures and/or functions.

An analogy is a comparison between two things that are usually thought to be different from each other, but that have something in common. Analogies help us to understand something because they are compared to something we already know.

A cell can be compared to a bakery.

1. Which cell part can be compared to the bakery walls? Explain.

The bakery walls are like the _____ of the cell because

_____

_____

2. Which cell part can be compared to the bakery work area? Explain.

The bakery work area is like the _____ of the cell because

_____

_____

3. Which cell part can be compared to the bakery manager? Explain.

The bakery manager is like the _____ of the cell because

_____

_____

4. Which cell part can be compared to the bakery business plan? Explain.

The bakery business plan is like the _____ of the cell because

_____

_____

5. Which cell part can be compared to the bakery oven? Explain.

The bakery oven is like the _____ of the cell because

_____

_____

6. Which cell part can be compared to the bakery refrigerator? Explain.

The bakery refrigerator is like the _____ of the cell because

_____

_____

Now make your own analogy for a cell. You can compare the cell to your school or house.

A cell is like _____.

The cell membrane is like the _____ because _____.

The nucleus is like the _____ because _____.

The vacuoles are like the _____ because _____.

The mitochondria are like the _____ because _____.

The cytoplasm is like the _____ because _____.

Task 5 Learning Target: I can create a model to represent the animal cell and critique models for strengths and limitations.

Names of Exhibit Designers: Group #_____

Key

cell membrane: _____

cytoplasm: _____

nucleus: _____

vacuole: _____

mitochondrion: _____

DNA/chromosome: _____

Strengths	Limitations

Participation

- Students have materials to make the model: (20 points)
- Students act professional during the class period and were on task: (20 points)

Students explain how materials represent the cell parts in terms of structure and function

- Cell Membrane: (structure 5 points + function 5 points)
- Cytoplasm: (structure 5 points + function 5 points)
- Nucleus: (structure 5 points + function 5 points)
- Mitochondrion: (structure 5 points + function 5 points)
- Vacuole: (structure 5 points + function 5 points)
- DNA/chromosomes: (structure 5 points + function 5 points)

Task 5 Learning Target: I can create a model to represent the animal cell and critique models for strengths and limitations.

Name: _____

Group	Strengths	Limitations
1		
2		
3		
4		
5		
6		

Participation						
I often contributed good ideas that were relevant to the topic and task. I came to meetings prepared. I did my share of the work.	5	4	3	2	1	I seldom contributed good ideas. Sometimes I was talking off-task. I did not come to meetings prepared. I did not do my share of the work.
Working with Others						
I often compromised and cooperated. I did take initiative when needed and/or listened and respected the ideas of others.	5	4	3	2	1	I seldom compromised and cooperated. I did not take initiative when needed and/or did not listen and respect the ideas of others.
Product						
My part of the task is complete and accurate. My work was submitted on time.	5	4	3	2	1	I did not complete my part of the task. The information I presented was inaccurate and/or not done correctly. It was not completed on time.
Understanding Content						
I can speak about the topic and group work knowledgeably. I can sum-up the lesson.	5	4	3	2	1	I do not understand what I did in my group. I did not ask or answer questions. I cannot sum-up the lesson.

Task 6 Learning Target: I can use household items to represent animal cell structures **and** functions.

Representing Cell Structures & Functions

Guidelines:

- ✓ You will need to think of household items that can be used to represent the following cell parts:
  - cell membrane
  - cytoplasm
  - nucleus
  - vacuole
  - mitochondrion
  - DNA/chromosome

- ✓ The cell part representations must be similar to the real cell parts in their structure **and** function. For example, the nucleus is round in shape and controls cell activities. The nucleus representation should be spherical and should represent a control center.

Be sure to explain the following:

1. Describe the structure **and** function of each cell part.

2. For each cell part, describe how the household item represents the structure **and** function.

Presentation Options:

a. Create a brochure/pamphlet or set of trading cards that clearly shows
   -the name of each cell part
   -a description of each cell part structure and function
   -an image of the household item representations
   -a description as to why the household item represents the structure and function

b. Create a song or commercial that clearly communicates
   -the name of each cell part
   -a description of each cell part structure and function
   -a description as to why the household item represents the structure and function

c. Create a model that clearly shows
   -household item representations for each cell part arranged in 1 animal cell display
   -a description of each cell part structure and function
   -a description as to why the household item represents the structure and function

Other options include:
Acrostic poem, comic strip, children's book or story, crossword puzzle, museum exhibit, student taught lesson, recorded game show.
*Be sure to conference with the teacher to review how the project guidelines will be met.

	3	2	1
Structure & Function	Thoroughly and correctly describes the structure **and** function of all required cell parts.	Thoroughly and correctly describes the structure **and** function of most required cell parts. There are 1 or 2 errors/missing details.	Thoroughly and correctly describes the structure **and** function of few required cell parts. There are 3 or more errors/missing details.
Rationale	Thoroughly and correctly describes the rationale for all required cell part representations in terms of structure **and** function.	Thoroughly and correctly describes the rationale for most required cell part representations in terms of structure **and** function. There are 1 or 2 errors/missing details.	Thoroughly and correctly describes the rationale for few required cell part representations in terms of structure **and** function. There are 3 or more errors/missing details.
Creativity	The entire presentation reflects an exceptional degree of student creativity in idea and display.	The presentation reflects student creativity in idea and display.	Student creativity is limited.

	Self ✓	Peer ✓
A cell membrane is neatly and creatively presented.		
Structure and function of a cell membrane is thoroughly described.		
The rationale for the cell membrane representation is clear in terms of structure and function.		
Cytoplasm is neatly and creatively presented.		
Structure and function of cytoplasm is thoroughly described.		
The rationale for the cytoplasm representation is clear in terms of structure and function.		
A nucleus is neatly and creatively presented.		
Structure and function of a nucleus is thoroughly described.		
The rationale for the nucleus representation is clear in terms of structure and function.		
A vacuole is neatly and creatively presented.		
Structure and function of a vacuole is thoroughly described.		
The rationale for the vacuole representation is clear in terms of structure and function.		
A mitochondrion is neatly and creatively presented.		
Structure and function of a mitochondrion is thoroughly described.		
The rationale for the mitochondrion representation is clear in terms of structure and function.		
DNA/chromosome is neatly and creatively presented.		
Structure and function of a DNA/chromosomes are thoroughly described.		
The rationale for the DNA/chromosome representation is clear in terms of structure and function.		

Task 7 Learning Target: I can present and analyze data on cell division.

Read the following:
Where do cells come from?

Sometimes you accidentally bite your lip or skin your knee, but in a matter of days the wound heals. Is it magic? Or, is there another explanation?
Every day, every hour, every second one of the most important events in life is going on in your body—cells are dividing. When cells divide, they make new cells. A single cell divides to make two cells and these two cells then divide to make four cells, and so on. We call this process "cell division" and "cell reproduction," because new cells are formed when old cells divide. The ability of cells to divide is unique for living organisms.

Why do cells divide?

Cells divide for many reasons. For example, when you skin your knee, cells divide to replace old, dead, or damaged cells. Cells also divide so living things can grow. When organisms grow, it isn't because cells are getting larger. Organisms grow because cells are dividing to produce more and more cells. In human bodies, cells divide nearly two trillion times every day.

How long does it take?

There are many different sorts of cells but all have roughly the same cell cycle. However, the time taken to complete it can vary enormously. The cell cycle of a fly embryo cell takes just eight minutes while a human liver cell cycle can last longer than a year. Some cells can withdraw from the cell cycle and rest before re-entering it. Many cells in growing embryos often skip the resting stages altogether. Cells that have stopped dividing, like brain cells, never re-enter the cell cycle.

What about the liver?

The liver helps you by taking toxins (substances in the body that are actually like poisons) out of your blood. If you ever accidentally ate something that was harmful, your liver would try to break it down and clear it out of your system. Damage to your liver may result from viruses, poor diet and toxins (from substances such as drugs and alcohol). Once damaged, your liver requires extra care. It takes about 1½ years for a liver cell to divide.

Watch the video: https://www.youtube.com/watch?v=rgLJrvoX_qo

Name:_____ Date: _____ Class: _____

In the space below, draw a picture of how a single liver cell becomes four cells and title it "Liver Cell Division."

Complete a table to show how long it would take one liver cell to become more than 120 cells:

Table 1: Cell Division of Liver Cells

Present Data: Use the data from Table 1 to construct a line graph (below) to show how the numbers of liver cells change over time.

- X axis Label
  - (Units of measure)
  - Constant scale
- Y axis Label
  - (Units of measure)
  - Constant scale
- Points connected with line
- Title (includes information from both axes labels)
- Key (or labels) identify all lines

Draw a Conclusion: Agree or disagree with the following statement:
Damaging liver cells is not serious because new cells will develop through cellular division.

_____

_____

_____

_____

_____

_____

_____

	3	2	1
Text to Visual	Diagram and title are related to the text with no errors.	Diagram and title are related to the text with 1 error.	Diagram and title are related to the text with more than 1 error.
Data Table	Tables include a title, units and numbers rounded to the nearest tenth. Data is calculated and recorded thoroughly and accurately. There are no major errors.	Most data is recorded accurately and precisely with few major errors.	Little data is recorded accurately and precisely with many major errors.
Graph	The graph clearly shows the relationship between both variables (The graph accurately includes all of the following: -a title -axes labels (with units of measure) -units following constant scale -bars/lines represent correct values -a key (or labels) identify all lines/bars	The graph shows the relationship between both variables. The graph accurately includes most of the following: -a title -axes labels (with units of measure) -units following constant scale -bars/lines represent correct values -a key (or labels) identify all lines/bars	The graph partially shows the relationship between both variables. The graph accurately includes few of the following: -a title -axes labels (with units of measure) -units following constant scale -bars/lines represent correct values - a key (or labels) identify all lines/bars
Conclusion	Conclusion is thorough and uses specific evidence from background text **and** data.	Conclusion is general and uses some evidence from background text **and** data.	Conclusion is general and uses some evidence from background text **or** data.