Workbook Preview

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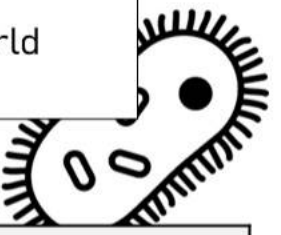
Grade 8 Science Unit

Cells

B1 - Relating Science and Technology to Our Changing World
B2 - Exploring and Understanding Concepts



	Curriculum Expectations	Pages
B1.1	assess how various technologies have enhanced our understanding of cells and cellular processes	12-15, 76-77, 83-85
B1.2	analyse beneficial and harmful effects of developments in cell	90
B2.1		11
B2.2	nucleus, cell membrane, cell wall, chloroplasts, vacuole, mitochondria, and cytoplasm, and explain their basic functions	18-27, 30-31, 67-72
B2.3	compare the structure and function of plant and animal cells	23-31
B2.4	explain the processes of diffusion and osmosis within a cell	35-41, 44-50
B2.5	describe various unicellular and multicellular organisms, and compare ways in which these two types of organisms meet their basic needs	39-41, 44-46, 53-62
B2.6	describe the organization of cells into tissues, organs, and systems	63-74

Preview of 75 pages from this product that contains 159 pages total.

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STEM INVESTIGATION AND COMMUNITICATION SKILLS

Cells





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Grade 8 Science Unit

Strand A - STEM Investigation and Communication Skills

	Curriculum Expectations	Pages
A1.1	use a scientific research process and associated skills to conduct investigations	32-33, 95, 97
A1.2	use a scientific experimentation process and associated skills to conduct investigations	16-17, 42-43, 51-52
A1.3	use an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems	32-33
A1.4	follow established health and safety procedures during science and technology investigations, including wearing appropriate protective equipment and clothing and safely using tools, instruments, and materials	16-17, 32-33, 42-43, 51-52
A1.5	communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes	16-17, 32-33, 42-43, 51-52
A2.1	write and execute code in investigations and when modelling concepts, with a focus on automating large systems in action	91-94, 99-100
A2.2	identify and describe impacts of coding and of emerging technologies, such as artificial intelligence systems, on everyday life, including skilled trades	91-95
A3.1	describe practical applications of science and technology concepts in various occupations, including skilled trades, and how these applications address real-world problems	91-94, 96
A3.2	investigate how science and technology can be used with other subject areas to address real-world problems	91-98
A3.3	analyse contributions to science and technology from various communities	91-93

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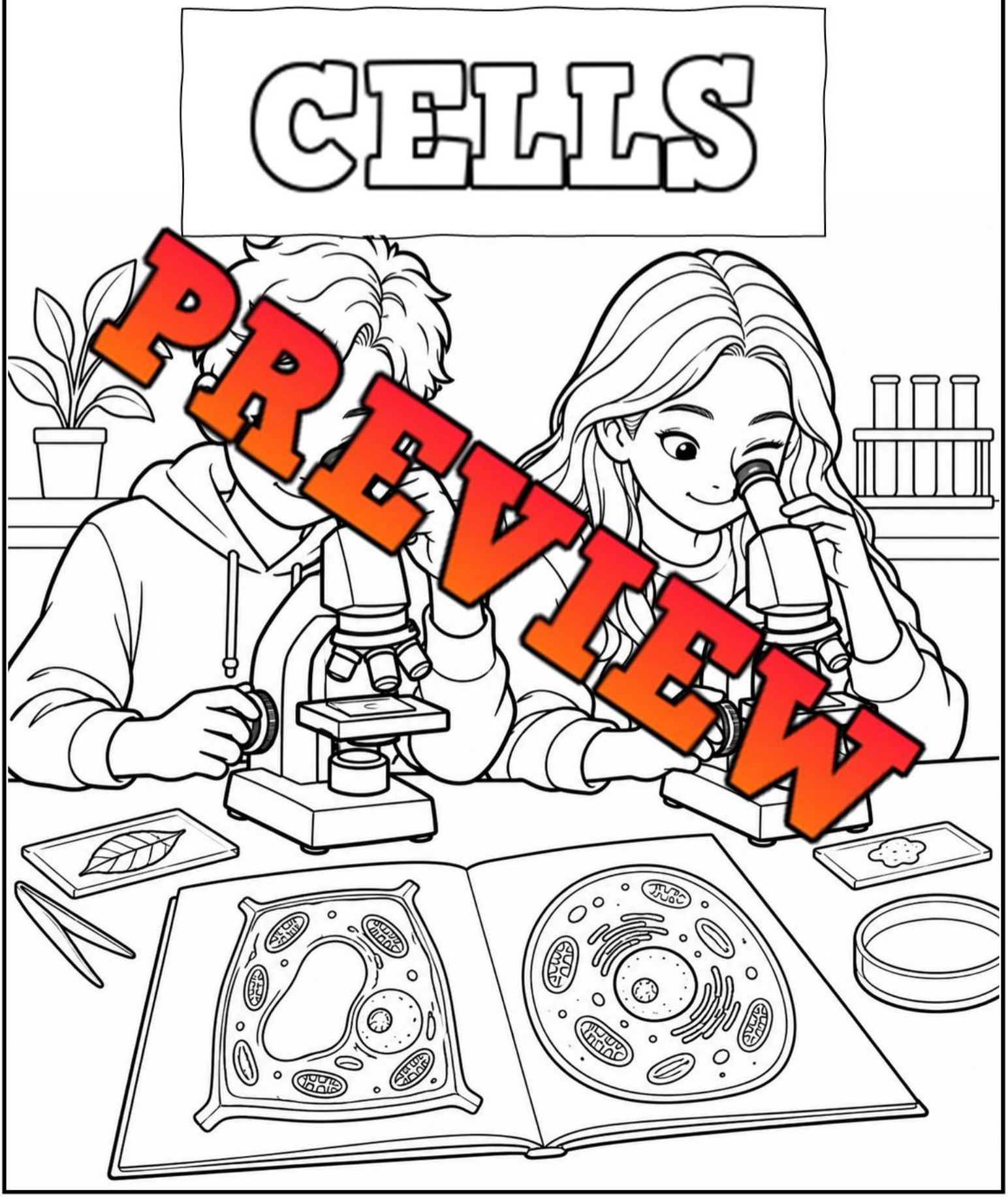

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Key Terms

Define Research the meaning of each of the key terms.

Cell Theory	
Nucleus	
Osmosis	
Unicellular Organisms	
Multicellular Organisms	
Plant Cells	
Animal Cells	

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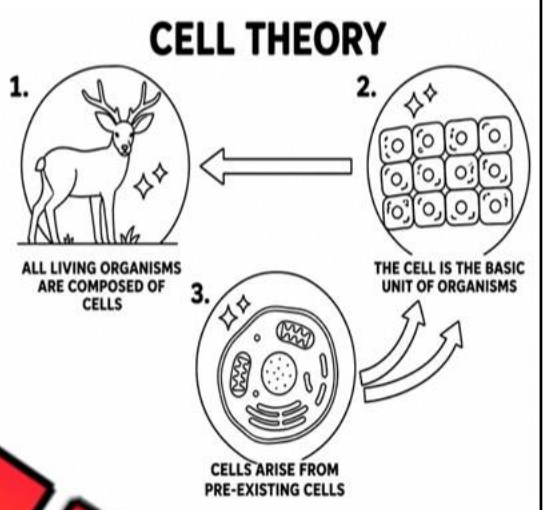
Curriculum Connection
B2.1

Cell Theory

What are Cells?

Cells are the smallest unit that can live on their own and that make up all living organisms and the tissues of the body. Cells are the basic building blocks of all living things.

The human body is composed of trillions of cells. They provide structure for the body, take in nutrients from food, convert those nutrients into energy, and carry out specialized functions.



Cell The

In the ...tury, **cell theory** was first formu... by The...vann and Matthias Schleiden. The... ...ts to the theory, that explained the ... of ce... ife.

1) The cell is the b... uni...
2) All cells come from ...ing ce...
3) All living things are ma... on... ...lls

The Cell Is The Basic Unit Of Life

The word **cell** in Latin translates to 'sm... room'. ... are like little rooms with important components th... w it ... its function. Cells make up the smallest level o... ...ts a... ...ey are the smallest unit of life that provide the building block... ...things.

All Cells Come From Pre-Existing Cells

All life comes from pre-existing life through the process of repro... ...ns that living things are needed to create more living things. For exa... ...reate seeds that then grow into living things.

Since cells are alive, cells too must have a reproductive mechanism that allows them to make new cells. Scientists now understand that cells do create new cells through cell division. Through mitosis, a parent cell divides to produce two identical daughter cells. For example, when you skin your knee, cells divide to replace old, dead, and damaged cells.

All Living Things Are Made Up Of One Or More Cells

All living organisms are composed of at least one cell. A living organism that is made of just one cell is called a unicellular organism. Examples of these include bacteria, protists, and yeast. Scientists estimate that humans are made of over 37 trillion cells. Humans are complex organisms that have many different organs each with their own structure and function.

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Curriculum Connection
B2.1

Questions

Use information from the text to support your answer.

1) What are cells? What do cells make up?

2) What is difference between humans and unicellular organisms?

PREVIEW

Summarize

the cell theory mean?

The Cell Is The Basic Unit Of Life	
All Cells Come From Pre-Existing Cells	
All Living Things Are Made Up Of One Or More Cells	

True or False

Circle whether the statement is true or false.

1) Humans are unicellular organisms.	True	False
2) All things, including non-living things are made of cells.	True	False
3) Cells can be made from machines.	True	False
4) Only living things can reproduce new living things.	True	False
5) Cells are the smallest living thing making them the smallest unit of life.	True	False

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Curriculum Connection
B2.1

Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____ | Mark

List five important facts about cell theory.

1	
2	
3	
4	
5	

Name: _____ | Mark

List five important facts about cell theory.

1	
2	
3	
4	
5	

Name: _____ | Mark

List five important facts about cell theory.

1	
2	
3	
4	
5	

Name: _____ | Mark

List five important facts about cell theory.

1	
2	
3	
4	
5	

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Curriculum Connection
B1.1

Microscopes

Microscope

In the first century, Romans made glass and noticed that objects appeared larger under glass. In the 12th century, Salvino D'Armate made a piece of glass fit over one eye, creating a magnification effect to examine things closeup. Eyeglasses became more popular in the 13th century because of this invention.

In the 13th century, a magnifying tube was invented. Two lenses were placed at opposite e[illegible]of a tube to provide a small magnification effect. It wasn't until 1609 that Galileo Ga[illegible]nted the first microscope. Zacharias Janssen is also credited with making o[illegible]earliest compound microscopes around the year 1600. A **compound micro[illegible]**w[illegible]s. These early microscopes could magnify an object up to 20 or 30 ti[illegible]normal


Compound Microscope

An[illegible]nie va[illegible]oek[illegible]ade microscopes by grinding his own lenses. H[illegible]o[illegible]rosc[illegible]ere more like magnifying glasses, as they only had [illegible]. But[illegible]quality lenses could magnify an object by up to 20[illegible]es[illegible]uwenhoek to observe animal and plant tissue, b[illegible]mine[illegible]fossils. It allowed him to see things no one had[illegible]n b[illegible]e

Today, modern microscope[illegible]an p[illegible]nification of 1000x. An **optical microscope** uses ligh[illegible]system[illegible]ses to generate magnified images of small obje[illegible]s. An eye[illegible]e pr[illegible]a slight magnification, say 10x and the objective l[illegible]vides magnification of 100x, which gives a total magnifi[illegible]n of [illegible]r magnification could be created, but the power of the light becomes t[illegible]g facto[illegible]e higher magnification does not show any more details.

Importance of the Microscope

Microscopes have created an entirely new dimension of science. Be[illegible]e m[illegible]pes, no one knew about cells because we couldn't zoom in and magnify our visio[illegible]665, Robert Hooke discovered cells. He first examined thin slices of bottle cork. He saw tiny pores that he named "cells". Hooke was unable to magnify his vision enough to notice any movement, meaning he couldn't see the living cells in action.


Electron Microscope

In 1676, Leeuwenhoek first saw life in cells when he observed blood cells and bacteria. His microscope provided a magnification of 270 times. In 1804, Karl Rudolphi and J.H.F. Link proved that cells had independent cell walls. This meant cells were the basic unit of life.

Microscopes have given scientists the ability to understand the basic unit of life. They are still being innovated, providing even more magnification. An **electron microscope** uses electrons instead of light waves. Electron microscopes can provide a magnified image up to 50 million times the objects true size!

PREVIEW

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Curriculum Connection
B1.1

Questions

Use information from the text to support your answer.

1) What is a microscope? Why are they important?

2) Why is t[illegible]agnification of a microscope important? How has the magnification increased [illegible] years as microscopes have been innovated?

PREVIEW

Summarize

Descri[illegible]e olutic[illegible] microscope.

True or False

Circle whether the statement is true or false.



1) A compound microscope uses just one lens.	True	False
2) Light becomes the limiting factor when magnifying over 1000 times.	True	False
3) Early microscopes could magnify only 20-30 times.	True	False
4) An electron microscope can magnify up to 50 million times.	True	False
5) Leeuwenhoek was the first to see a cell under a microscope.	True	False

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Curriculum Connection
B1.1

Microscope Diagram

Diagram Label the parts of the diagram using the word bank.

Ocular Lenses	Objective Lens	Carrying Handle	Stage
Revolving Nosepiece	Coarse Adjustment	Slide Holder	Fine Adjustment
Intensity Control		Light	



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Curriculum Connection
B1.1

Microscope Parts and Functions

Explain What is the function for each of the parts below?

Microscope Part	Function
Ocular Lenses	
Revolving Nosepiece	
Light Intensity Control	
Objective Lens	
Slide Holder	
Carrying Handle	
Coarse Adjustment	
Fine Adjustment	
Light	
Stage	

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Curriculum Connection
A1.2, A1.4, A1.5

Microscope Experiment - Onion

Background — Information before you begin

Performing the experiment below will allow you to view plant cells under a microscope. A single layer of cell membrane will be stained so that we can see some cell structures, including the nucleus and cell membrane/wall.

Materials — What will you need for the experiment?

- ❑ On
- ❑ Knife
- ❑ Glass microsc ides
- ❑ Cover slides
- ❑ Iodine solution
- ❑ Dropper
- ❑ Microscope
- ❑ Paper towel





PREVIEW

Procedure — How will you complete the experiment?

1) Set aside a clean microscope slide.

2) Cut a small piece of onion so that you have one single layer.

3) Carefully peel the thin layer of membrane from the inside of the piece of onion.

4) Place the section of membrane carefully on the microscope slide. Try to keep it as flat as possible.

5) Apply 2-3 drops of iodine to the section. Wait 2 minutes before putting the cover slide over the section.

6) Place the slide under a 40x magnifying lens. Observe!

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Curriculum Connection
A1.2, A1.4, A1.5

Observations | What did you see?

Draw what you see under the microscope. Label the cell wall and the nucleus in your drawing.

PREVIEW

Results | Answer the questions below.

1) How many cells did you draw above?

2) What did each cell have?

3) Approximately how many cells do you think are in the small section you were examining?

4) Why can't you see more cell components?

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Curriculum Connection
B2.2

Organelles in Cells

What is an Organelle?
An **organelle** is a specialized part of the cell that has a specific function. Organelles do a job for the cell they are in just like organs do a job for the body system they are in. Plant and animal cells have many of the same organelles, but not all.

Nucleus
The **nucleus** is the command centre of the cell that stores the cell's DNA and controls all the cell's a ies. These activities include growth of the cell, metabolism, protein synthesis, oduction (cell division).

Cell M s embrane
The **c mbrane** protection for the cell. It provides a fixed environment inside the cell t cont r organelles. The cell membrane has many functions, including trans ents be cell and transporting toxic substances out of the cell. The cell me s mad , hence why it is often called the plasma membrane.

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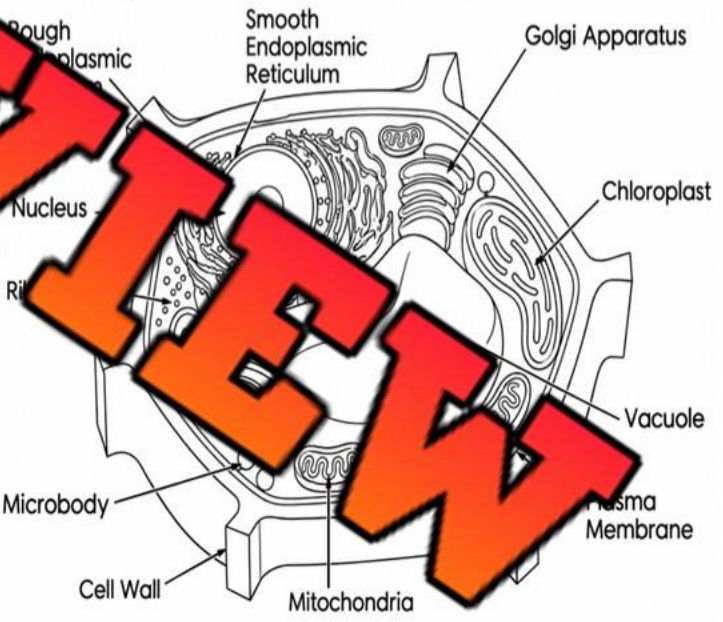

Cell Wall
The **cell wall** surrounds the ce bra and provides the cell with shape, suppo protection. A cell wall is **semi-permeab** meaning molecules can pass in and out of the cell. Cell walls are only in plant cells.

Chloroplasts
Only plant cells have chloroplasts, which are organelles that are responsible for photosynthesis. **Chloroplasts** take in light energy and convert it into chemical energy via the photosynthetic process.

Vacuole
Vacuoles are sacs that take in waste products, like harmful toxins, and get rid of these waste products. Often, the waste is water, so the vacuole works to maintain the balance of water inside and outside the cell.

Mitochondria
The **mitochondria** are the powerhouses of the cell that work to transform molecules like glucose and turn them into energy that the cell needs. When the mitochondria converts the glucose, it is stored as chemical energy called adenosine triphosphate (ATP).

Cytoplasm
The **cytoplasm** is the gel-like fluid inside the cell that is responsible for holding the organelles and protecting them from damage.

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Curriculum Connection
B2.2

Questions Use information from the text to support your answer,

1) What is an organelle? What do they do?

2) Do plant[illegible]d animals have the same organelles? Explain.

Explain What is the fu[illegible]r ea[illegible]rganelles below?

Organelle	Fu[illegible]
Nucleus	
Cell Membrane	
Cell Wall	
Chloroplasts	
Vacuole	
Mitochondria	
Cytoplasm	

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Curriculum Connection
B2.2

Research – Cell Components

Cells have many organelles and important components that allow it to function to provide life. Learn more about each component by researching them below.

Explain What is the function for each of the organelles below?

Compo	Function
Nuc us	
Ribosomes	
Vesicles	
Endoplasmic Reticulum	
Golgi Apparatus	

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Explain What is the function for each of the organelles below?

Component	Function
Cytoskeleton	
Peroxisome	
Cytosol	
Lysosome	
Centriole	

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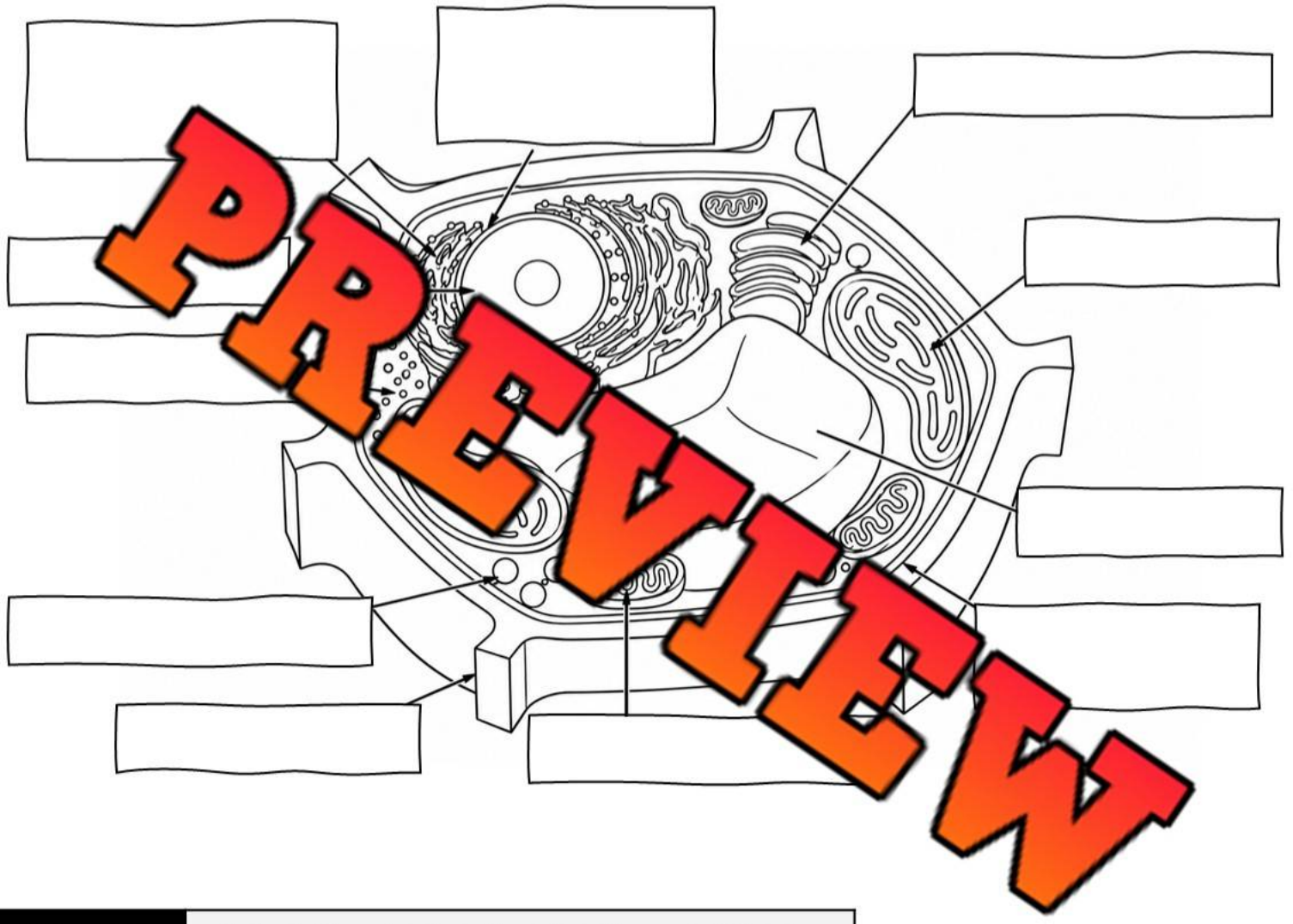
Curriculum Connection
B2.2, B2.3

Plants Cell - Diagram



PREVIEW

Diagram Label the plant cell using the word bank.

Rough Endoplasmic Reticulum	Smooth Endoplasmic Reticulum	Chloroplast	Vacuole
Plasma Membrane	Mitochondria	Cell Wall	Microbody
Ribosome	Nucleus	Golgi Apparatus	

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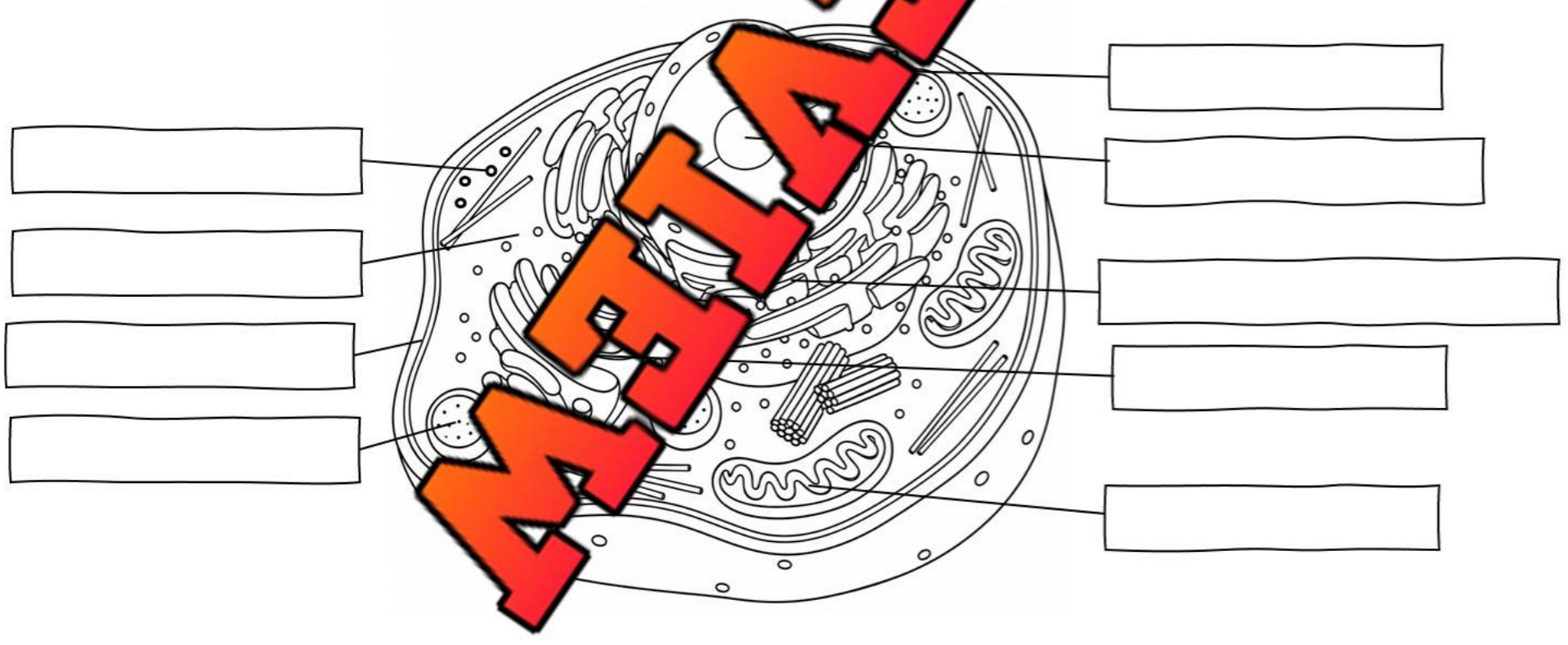
Curriculum Connection
B2.2, B2.3

Animal Cell - Diagra

PREVIEW

Ribosome	Cytoplasm	Cell Membrane
Golgi Apparatus	Nucleus	Nucleolus
Mitochondria	Lysos	Endoplasmic Reticulum



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Curriculum Connection
B2.2, B2.3

Matching Activity - Organelles



Matching | Match the function/description to the organelle

Answer	Organelle	Function/Description
	Cytoplasm	A) Made of plasma and provides protection for the cells. Also allows nutrients and toxins in and out of the cell.
	C	B) Found inside the nucleus and is responsible for making the cell's ribosomes.
	G[illegible]s	[illegible]nly found in plant cells. Surrounds the cell membrane [illegible]vides the cell with shape.
	Cell Membra[illegible]	D) The co[illegible]l centre of the cell that stores the cell's [illegible]and [illegible]l the cell's activities
	Nucleolus	E) Tran[illegible]ation sy[illegible]r[illegible] cell
	Mitochondria	F) Gel-like fluid i[illegible]th[illegible]nsible for holding the organelles [illegible]rotecting [illegible]rom damage.
	Cell Wall	G) Sacs that take in waste pro[illegible]ucts, [illegible]s, and get rid of these waste products
	Lysosome	H) The powerhouses of the cell that work [illegible]ransform molecules like glucose and turn them into energy that the cell needs
	Endoplasmic Reticulum	I) Prepares proteins and lipid (fat) molecules for use in other places inside and outside the cell
	Vacuole	J) Takes in light energy and converts it into chemical energy via photosynthesis
	Chloroplast	K) Contains digestive enzymes and breaks down excess or worn-out cell parts

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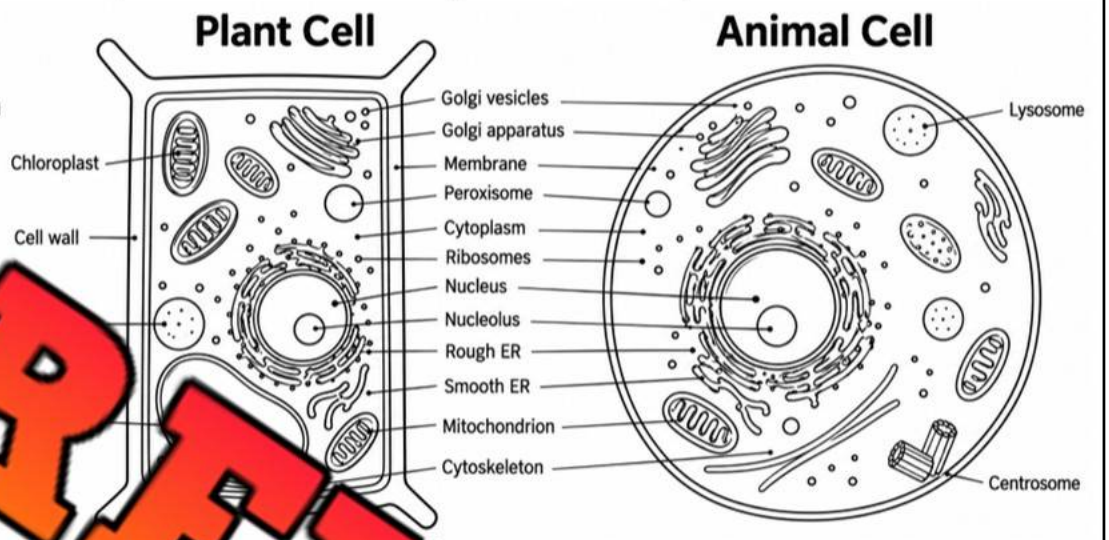
Curriculum Connection
B2.2, B2.3

Plant and Animal Cells

Plant and Animal Cells

All living things are made up of the basic building blocks of life, called cells. Plants and animals are both living things, which means they are both made of cells. The cells that make up plants are similar to the cells that make up animals, but there are some differences in the organelles they contain.



PREVIEW

Similarities Between Plant and Animal Cells

Both plant and animal cells have the following organelles:

- Nucleus
- Mitochondria
- Endoplasmic reticulum
- Golgi apparatus
- Lysosomes
- Have a cell membrane
- Contain cytoplasm



Differences Between Plant and Animal Cells

Animal cells have:

- No cell wall
- No chloroplasts
- Many small vacuoles
- An irregular shape that is rounded
- A nucleus in the centre of the cell
- Are between 10-30 micrometres in length

Plant cells have:

- Chloroplasts
- A cell wall
- A large central vacuole
- A definite shape that is usually rectangular or cubic
- A nucleus that is usually pushed to the side
- A larger size of 10 to 100 micrometres in length

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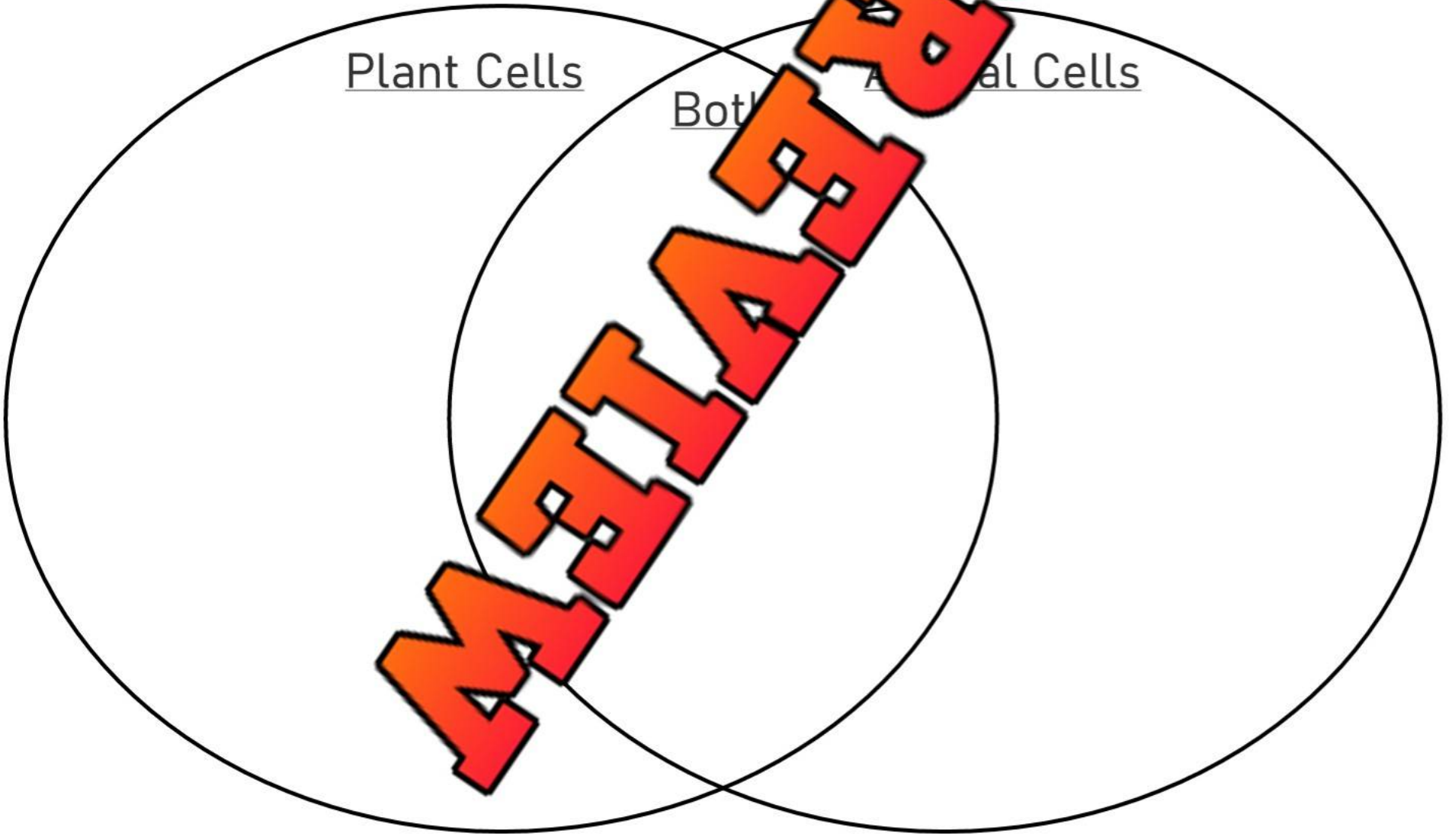
B2.2, B2.3

Venn Diagram Fill in the Venn diagram showing the similarities and diffe[illegible]between plant and animal cells.



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Curriculum Connection
B2.3

Table Fill in the table by explaining the feature for plant and animal cells.

Feature	Animal Cell	Plant Cell
Cell Size		
Cell Sh		
V es		
Cell Wall		
Chloroplasts		
Nucleus Location		

PREVIEW

Summarize Write a summary of the differences between animal c s.

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Curriculum Connection
B2.3

Examine Judging by the picture of the cell, is it a plant or animal cell? Explain.

Picture	Type of Cell	Explanation
	Plant Cell Animal Cell	
	Plant Cell Animal Cell	
	Plant Cell Animal Cell	
	Plant Cell Animal Cell	

PREVIEW

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Curriculum Connection
B2.2, B2.3

Draw	Draw a diagram of a plant and animal cell. Label the organelles.

Animal Cell				
Ribosome	Cytoplasm	Golgi Apparatus	Endoplasmic Reticulum	Lysosome
Nucleolus	Nucleus	Mitochondria	Cell Membrane	

PREVIEW

Plant Cel				
Endoplasmic Reticulum	Golgi Apparatus	Chlor	Vacu	Ribosome
Plasma Membrane	Mitochondria	Cell Wall	Nu	lasm

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Curriculum Connection
A1.1, A1.3, A1.4, A1.5

Activity – Plant and Animal Cell Model

Background — Information before you begin

Create a 3D model of a plant or animal cell by choosing some of the materials below. There are so many options for materials, including edible options. Verify with your teacher whether you can use food options before choosing those materials.

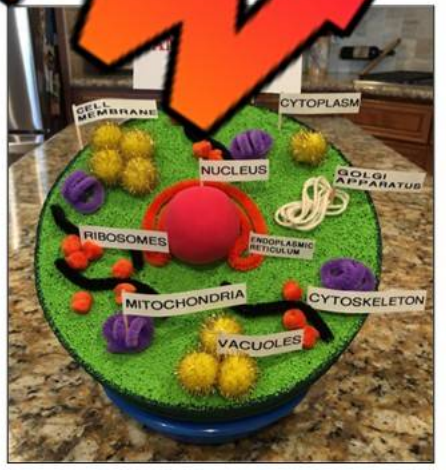
PREVIEW

Materials — ...you could use for your model



- **Base**: Styr... ...box, clay or playdough, ...e, ric... ...rownie
- **Organelles**: pipe clea... ...y dou... felt, candy
- **Labels**: small pieces of paper and ...oothpick...

Procedure — How you will complete the model



1) Decide if you will make a plant or animal cell
2) Will you create an edible model or a model out of craft materials?
3) Choose the materials you will use. Choose a base as well as the materials for the organelles
4) Construct the model by considering the shape and location of the organelles
5) Label each organelle using strips of paper with handwritten or typed labels. Use toothpicks if your model is soft or tape/glue if your model is hard to attach the labels to the model

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Curriculum Connection
A1.1, A1.3, A1.4, A1.5

Questions Answer the questions below.

1) Which type of cell did you choose?

2) Which organelles did you include in your model?

3) Where did you put the

4) Describe the vacuole you included.

5) Which organelles did you include that are not in the other type of ? Ex. If you chose an animal cell, which organelles did you include that are not in a plant cell?

6) Describe the shape of the model cell you made. Why did you make it this shape?

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Activities – Cell Theory and Cell Organelles

Word Search

Find the words from the word bank.



Cell	Theory	Organelles	Chloroplasts	Vacuole
Mitochondria	Cytoplasm	Wall	Membrane	Nucleus
Lysosom	Centriole	Plant	Animal	Golgi

L	S	N	A	R	B	M	E	M	B	E	A	V	K	Y	G	J	S
K	E	E	V	N	M	C	P	F	J	E	P	J	P	J	A	U	
I	E	V	N	Q	S	A	W	L	I	X	Z	X	A	N	E		
A	S	A	S	V	A	O	G	U	W	T	T	W	I	L			
G	H	C	L	O	L	H	V	Y	K	N	Z	M	C				
Q	N	U	T	R	B	L	P	I	J	I	L	A	A	U			
E	R	O	M	O	L	M	A	T	O	S	O	M	E	L	N		
V	Q	L	G	P	L	T	N	G	P	F	Y	I	P				
X	Q	E	U	L	E	E	J	K	R	N	P	B	I				
D	Y	N	B	A	C	B	C	W	E	O	R	W	W	H			
X	H	E	U	S	V	I	Y	D	S	R	V	W	G				
X	K	M	I	T	O	C	H	O	N	D	R	I	A	I	T		
K	V	T	U	S	D	M	R	W	C	Y	R	O	E	H	T	H	X

PREVIEW

Word Scramble

Unscramble the words from the word bank.



GNLEERAOLS		NIHIAMDOOCRT	
OELETNCRI		LCLE	
ANBEEMRM		SLOSOMEY	
ETHYOR		LIAANM	
LSUUNEC		OCOSATRLHPSL	

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Curriculum Connection
B2.4

Diffusion and Osmosis in Cells

What is Diffusion and Osmosis in Cells?

Both diffusion and osmosis are transport processes that move molecules from an area of higher concentration to an area of lower concentration. Cells require these processes as they need nutrients to be transported into cells and harmful materials out of cells.

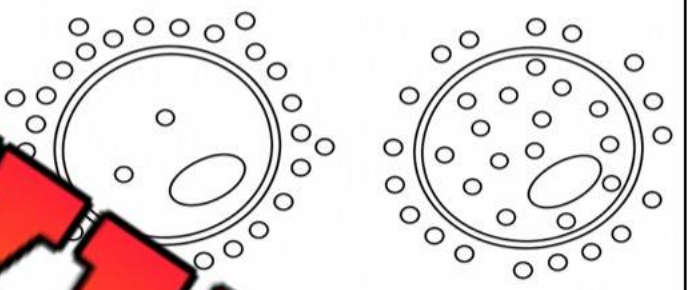
Plasma membranes need to allow certain substances to enter and leave a cell. They also need to prevent harmful material from entering and essential material from leaving. This means plasma membranes are **semipermeable**, as they allow some molecules through but not oth

The ting of these substances is passive. **Passive transport** is a naturally occurrin oes not require the cell to use energy to accomplish the move

PREVIEW

What is Diffusion?

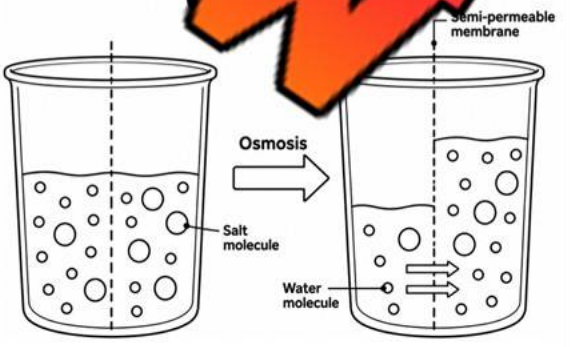
Diffusion is the of mo from areas of higher c tion t wer concentration so that throughout. An example o in act when we spray perfume. The ati perfume is highest in the bottle a lowe edges of the room. The perfume vapour or spread out from the bottle and gradua , more p fur from the bottle will smell the scent as it spreads.



Diffusion helps in the movement of substa and f or example, when our blood becomes oxygenated, oxygen is diffusing i . The needs oxygen so it can deliver oxygen to cells throughout the body. The mole re moving from high concentrations in the blood, to low concentration in t out the body.

What is Osmosis?

Osmosis is the movement of water molecules through a semipermeable cell membrane from areas of high concentration to areas of low concentrations. For example, plants take in water and minerals from roots with the help of osmosis. Whereas diffusion transports material across membranes and within cells, osmosis only transports water.



Water will move from areas of high concentration to areas of lower concentration. In the diagram, you'll notice the first glass has a higher concentration of water molecules on the left side as the right side has more salt molecules. Through osmosis, the water molecules move through the semipermeable membrane into the area of lower concentration. The second glass shows the result, which is a balanced amount of water molecules compared to salt molecules.

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Curriculum Connection
B2.4

Questions

Use information from the text to support your answer.

1) Define the terms below.

Term	Definition
Semipermeable Membrane	
Diffus	
sis	

2) Give an exa you experienced diffusion.

3) Why do cells require diffusion? Does it requir gy fro U?

PREVIEW

True or False

Circle whether the statement is true or false.

1) Diffusion is the movement of only water through a membrane.	True	False
2) Osmosis is the movement of water from low to high concentrations.	True	False
3) Diffusion is the movement of molecules from high to low concentrations.	True	False
4) Oxygen is diffused into blood cells.	True	False
5) Plants use osmosis to get water from their roots.	True	False

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Curriculum Connection
A1.2, A1.4, A1.5

Diffusion – Hot and Cold Water

Background — Information before you begin

Have you ever smelled someone's lunch who just opened their lunch box? Or smelled someone's perfume after the person was gone? If so, you have experienced diffusion. **Diffusion** is the movement of particles from an area of high concentration to an area of low con ntration.

Materia a u will need for the experiment

- ❑ Two clear
- ❑ Hot and cold f you water or near boiling water as old w om the tap, the experiment will
- ❑ Food colouring – two colours wor st. Yo could use red for the hot water and blue for but the colours aren't important



PREVIEW

Procedure — How you will complete the experiment

1) Fill both glasses with water. In one glass, add the hot water and in the other, add the cold water

2) Add a few drops of food colouring in each glass. Use about 3-4 drops. If you put too much, the concentration of food colouring will be too large which will cause the diffusion to happen too quickly

3) Watch closely as the food colouring spreads in the water. Notice if the food colouring diffuses faster in the hot or cold water



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Curriculum Connection
A1.2, A1.4, A1.5

Results | Answer the questions below.

1) What is diffusion?

2) Which type of water did the food colouring diffuse in faster?

3) Why d[illegible] food colouring diffused faster in the hot water?

4) What happened when t[illegible]n pro[illegible]over?

5) How could you have sped up the diffusion pr[illegible] both

6) Which liquid is more concentrated – the water or the food colour

7) If you add another 3-4 drops of food colouring into the glass, will the diffusion be slower or faster than when you mixed the food colouring with just water? Explain by referring to the differences in concentrations (concentration gradient)

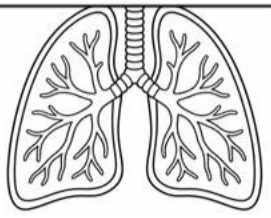
PREVIEW

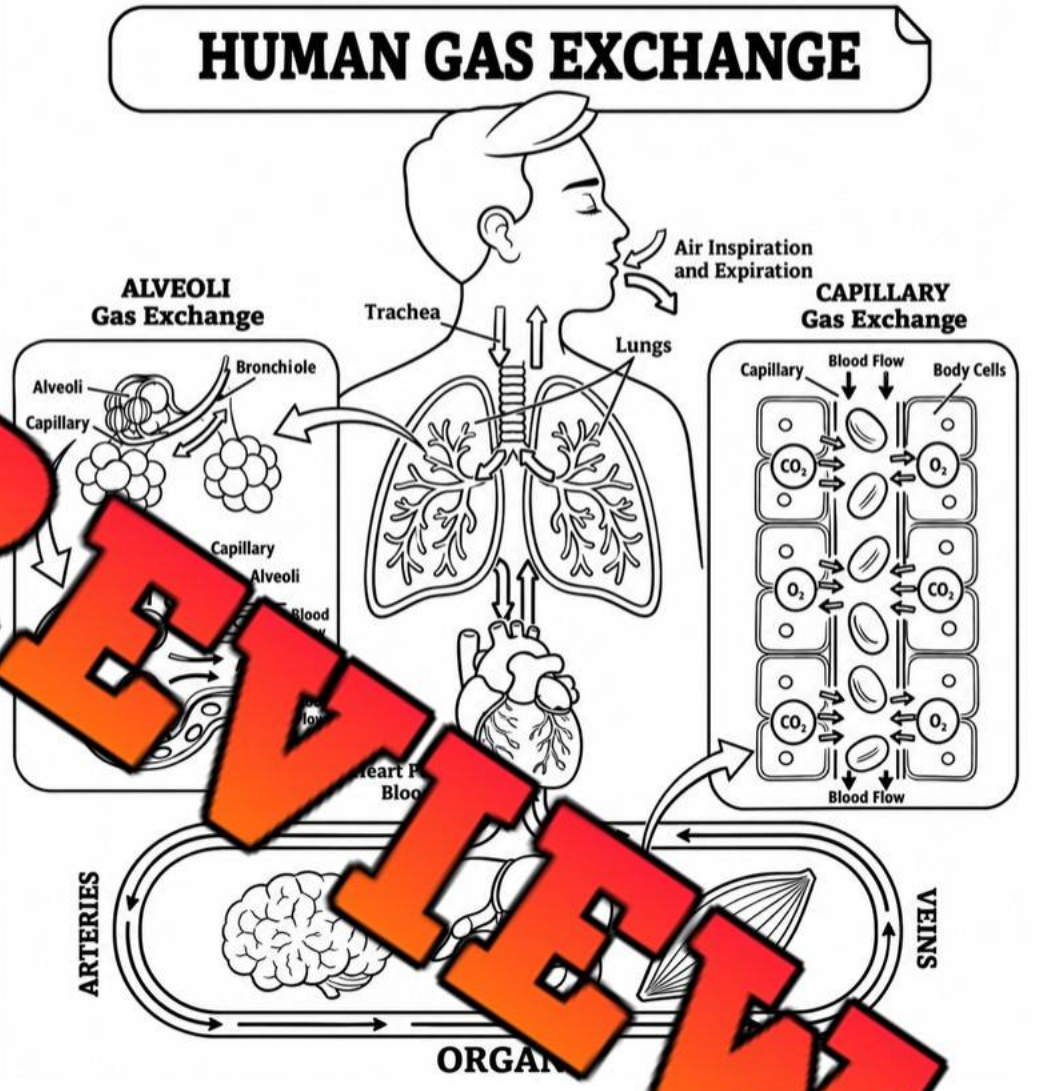
Name: _____ 44

Curriculum Connection
B2.4, B2.5

Diffusion in Our Respiratory System

Diffusion in our Respiratory System
The respiratory system works with the circulatory system to complete the human gas exchan
The **hum** **exchange** proces taking our cells removing carb dioxide waste tha cells produce. The human gas exchange relies on diffusion to move the oxygen and carbon dioxide in and out of the cells.





PREVIEW

Summarize Summarize the human gas exchange by describing the am.

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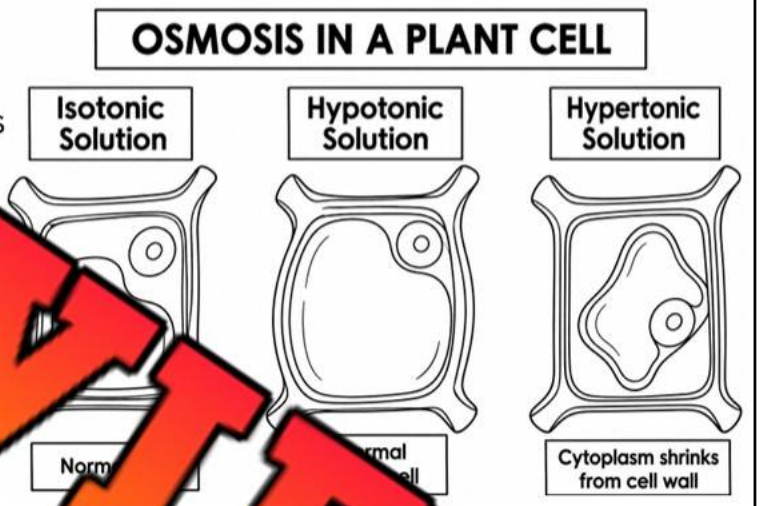
Curriculum Connection
B2.4

Osmosis in Cells

Osmosis in Plant Cells
Osmosis is a type of diffusion that happens when water flows into or out of a cell depending on the concentration of a solute, such as salt. Osmosis is a passive transport process, meaning it happens naturally without the need of energy from the cell.

Solute vs Solvent
Osmosis deals with chemical solutions. A solution has two parts, a solute and a solvent. A **solute** is a substance, like salt or sugar that dissolves into the solvent. A **solvent** is a substance, usually water, that is able to dissolve solutes. For example, saltwater is a solution of salt (solute) and water (solvent).



Types of Solutions
There are three types of solutions that cells can be in: (1) Isotonic (2) Hypotonic (3) Hypertonic.

1) Isotonic Solution
An isotonic solution is one where the concentration of solutes is the same both inside and outside of the cell. For example, a cell that has the same concentration of salt inside as salt that is in the water (solvent) outside is in an isotonic solution. This would result in the same amount of water entering and leaving the cell's membrane.

The optimal conditions for animal cells to be in is an isotonic solution. This is because there is equal amounts of water entering and leaving the cell. If more water entered the cell than existed, the animal cells will burst.

2) Hypotonic Solution
In a hypotonic solution, there is a higher concentration of solutes inside the cell than outside. As a result, more solvent will enter the cell compared to the amount of water leaving it in order to balance the concentration levels.

The optimal conditions for a plant cell to be in is a hypotonic solution. This is because more water will enter the plant cell, which allows it to complete the process of photosynthesis. Plant cells will not burst as easily because they have strong, thick cell walls.

3) Hypertonic Solution
A hypertonic solution is the opposite of a hypotonic solution as there is more solute outside the cell than inside it. This causes more solvent to exist in the cell because it is trying to lower the concentration of solute outside the cell. This is not an ideal condition for either plant or animal cells as water rushes out of the cells causing them to dry up and die.

PREVIEW

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Curriculum Connection
B2.4

Questions

Use information from the text to support your answer.

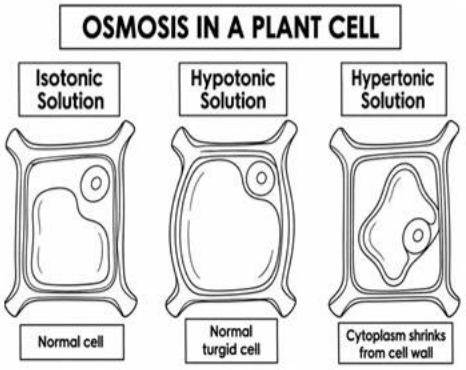
1) What is the optimal conditions for an animal cell to be in? Why?

2) What is t optimal conditions for a plant cell to be in? Why?

PREVIEW

Explain

What is happe to the pl in the different solutions?



Isotonic	
Hypotonic	
Hypertonic	

True or False

Circle whether the statement is true or false.

1) A solution has a solute and a solvent.	True	False
2) In a saltwater solution, the solvent is salt.	True	False
3) In an isotonic solution, water moves in and out equally.	True	False
4) In a hypotonic solution, more water moves out of the cell making it dry.	True	False
5) The ideal condition for an animal cell is to be in a hypotonic solution.	True	False

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Curriculum Connection
A1.2, A1.4, A1.5

Experiment - Osmosis

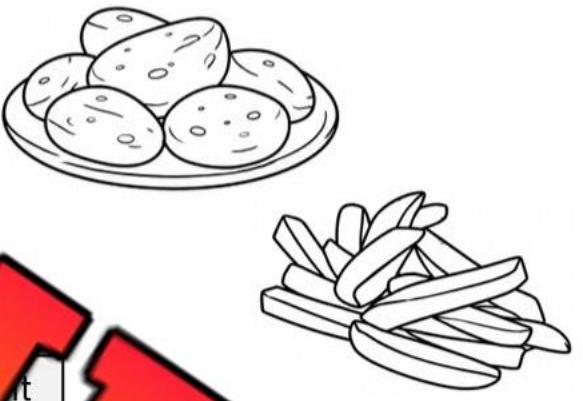
Background — Information before you begin

Osmosis is the diffusion of water across a semi-permeable membrane from an area of a high concentration of water, to an area of lower concentration. Salt will play a role in how water moves. Water always moves from an area of less salt to more salt. Let's test this p[illegible]iple.

PREVIEW

Mate[illegible] will need for the experiment

- ❑ A potato
- ❑ Salt
- ❑ Water
- ❑ 2 clear drinking glasses



Procedure — How you will complete the exper[illegible]t

1) Fill both glasses with water.
2) In one of the glasses, add 2-3 tablespoons of salt and [illegible] it.
3) Slice up a potato into French fry sized pieces.
4) Split the potato pieces up and put half in each glass. Make sure they are totally submerged in the water.
5) Write a hypothesis, predicting which potato slices will turn brown and which will stay white. Also, decide which potato slices will be flexible (bendy) and which will stay firm.
6) Wait 24-hours and dump out the fries onto a plate.
7) Which fries are still firm? Which fries are all dried out? Which fries turned brown and which kept their colour?

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Curriculum Connection
A1.2, A1.4, A1.5

Hypothesis

What do you think will happen?

Describe what will happen to the fries in both types of water – colour, firmness	
Water	**Saltwater**

Observation

t happened?

Describe what happened t s in bo s of water – colour, firmness	
Water	**Saltwater**

PREVIEW

Results

Answer the questions below.

1) What is osmosis?

2) Why did the French fries in saltwater become bendy and brown?

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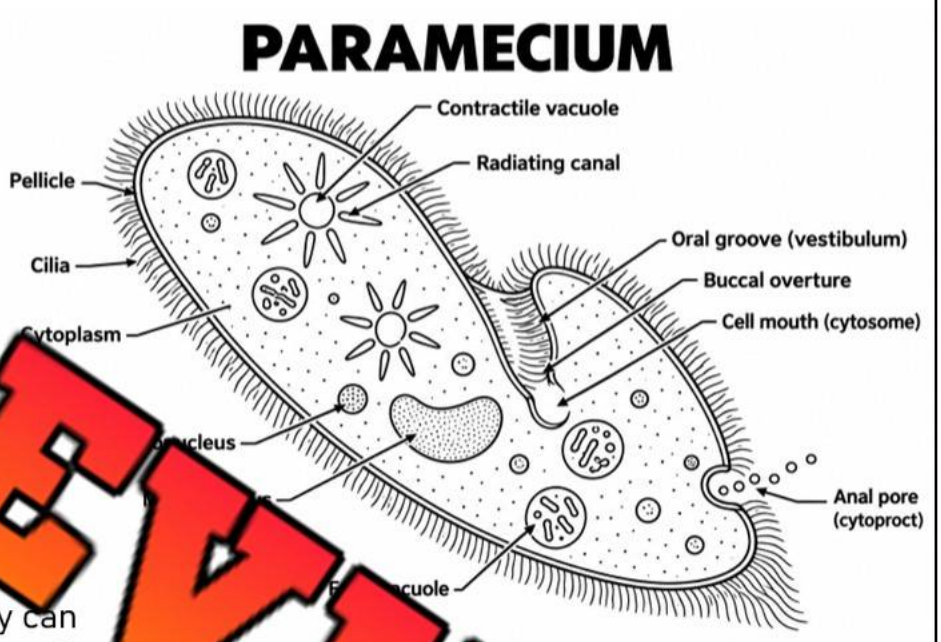
Unicellular Organisms

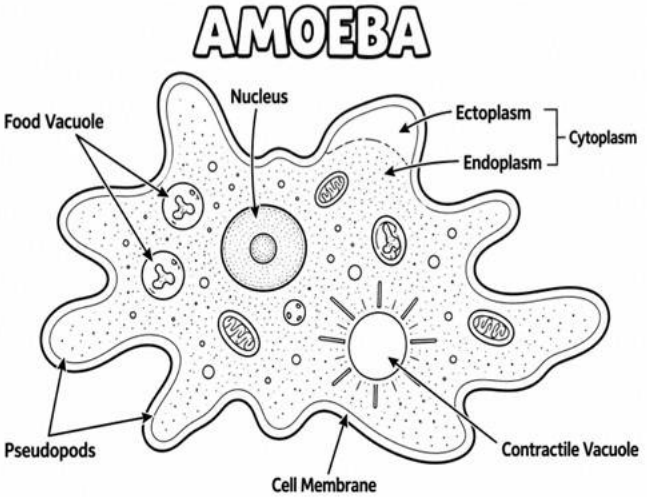
What are Unicellular Organisms?
A **unicellular organism** is a single-celled organism that consists of just a single cell. Examples of unicellular organisms are bacteria, protists, amoebas, yeast, and paramecium.



Paramecium
A paramecium is a slipper-sh[illegible]rganism that has only [illegible]at is found in pond [illegible]llular orga[illegible]gan[illegible]t help it [illegible] its ba[illegible] it can survive. [illegible] from the pond [illegible] digests it in organe[illegible]lled food vacuoles. Nutrient[illegible] the food then travel throug[illegible] cytoplasm to the other organe[illegible] which gives them energy so they can function. This allows the cell to continu[illegible]iving.

The outside of the cell has cilia, which are li[illegible]rs tha[illegible] the paramecium cell. The cilia help move the ce[illegible]hippi[illegible] forth in ponds to propel the organism through its surroundings.

Amoeba
An amoeba is a unicellular organism that we cannot see, bu[illegible]live[illegible] including in soil, ponds, lakes, forests and rivers. They can usually b[illegible]f warm freshwater.



Amoebas have a cell me[illegible]ne that encloses its organelles inside. They have a nucleus that has their DNA packaged inside. To eat, an amoeba stretches out a pseudopod, surrounds a piece of food, and pulls it into the rest of the amoeba's body. Amoebas eat algae, bacteria, other protozoans, and tiny particles of dead plant or animal matter. After the food particle is in the cell, a food vacuole forms around it.

Amoebas crawl to move around. They use their pseudopods to reach out and grab some surface and pull themselves forward.

PREVIEW

Name: _____ 54

Curriculum Connection
B2.5

Questions

Use information from the text to support your answer.

1) What is a unicellular organism? Give some examples.

2) Fill in the table below to explain how the cells meet their needs.

	Amoeba	Paramecium
Eat		
Move		

PREVIEW

Questioning

Write 2 questions you have about the reading

1)	
2)	

True or False

Circle whether the statement is true or false.

1) Amoebas have cilia that help them move.	True	False
2) Unicellular organisms have organelles that help the cell meet their needs.	True	False
3) A food vacuole forms around food when it enters the cell.	True	False
4) A paramecium uses cilia to help them move.	True	False
5) Amoebas can be found in warm freshwater bodies of water, like ponds.	True	False

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Curriculum Connection
B2.5

Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Is the statement true or false?

1) Unicellular organisms are made up of only one cell.	T	F
2) Paramecia use pseudopods to move through water.	T	F
3) Amoebas use pseudopods to surround and capture food.	T	F
4) Paramecia digest food inside structures called food vacuoles.	T	F
5) Amoebas can only survive in ponds and cannot live in soil.	T	F
6) Amoebas use cilia to move around and capture food.		

Name: _____

Is the statement true or false?

1) Unicellular organisms are made up of only one cell.	T	F
2) Paramecia use pseudopods to move through water.	T	F
3) Amoebas use pseudopods to surround and capture food.	T	F
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5) Amoebas can only survive in ponds and cannot live in soil.	T	F
6) Amoebas use cilia to move around and capture food.		

Name: _____

Is the statement true or false?

1) Unicellular organisms are made up of only one cell.	T	F
2) Paramecia use pseudopods to move through water.	T	F
3) Amoebas use pseudopods to surround and capture food.	T	F
4) Paramecia digest food inside structures called food vacuoles.	T	F
5) Amoebas can only survive in ponds and cannot live in soil.	T	F
6) Amoebas use cilia to move around and capture food.		

PREVIEW

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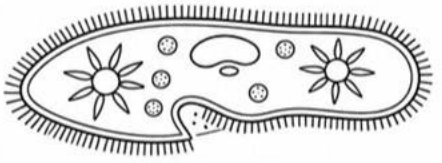
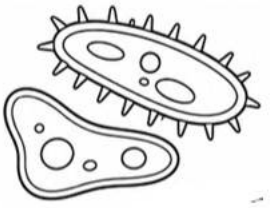
Curriculum Connection
B2.5

Research – Unicellular Organisms

Research one of the unicellular organisms below. Answer the questions to learn more about how the cell meets its needs.

- Euglena
- Chlamydomonas
- Chlorella
- Spiro







Resea ns he questions below.

1) Which cell d e to rch?
2) What organelles does t e?
3) List 3 important organelles from the cell and descri r nctio

PREVIEW

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Curriculum Connection
B2.5

Explain What is the function for each of the organelles below?

4) How does the cell eat or get nutrition? Explain the process.

5) How does the

6) Draw a diagram of the cell. Label the organe

PREVIEW

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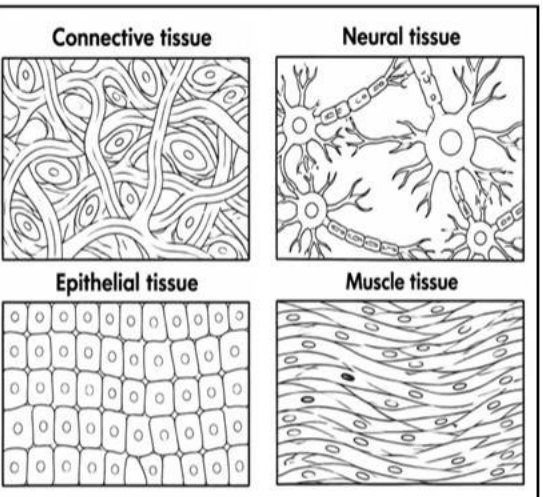
B2.5

Multicellular Organisms – Humans and Worms

What are Multicellular Organisms?

Multicellular organisms are composed of more than one cell. These organisms have groups of cells that differentiate to be able to do different tasks. In humans, cells differentiate early in development so they can become hair cells, muscle cells, nerve cells, blood cells and many other types of cells.



Groups of cells that work together are called tissues. Our bodies have four main types of tissues – muscle (muscle tissue), nervous (brain) tissue, connective (bone) tissue, and epithelial (skin) tissue.

The structure and function of these different groups of cells are different and is related to their function because cells need a certain shape to allow them to complete their task. For example, outer skin cells are flattened so they can protect the body from the environment. In addition, muscle cells are long so they can be bundled together for muscle contraction.

In multicellular organisms, different cells may have different amounts of organelles as well. For example, muscle cells have more mitochondria than most other cells to help them produce energy for movement. Our muscles allow us to move, so these extra mitochondria are needed.

PREVIEW

Worms – Multicellular Organisms

Worms are invertebrates as they have no backbone. An earthworm is a multicellular organism. The cells of an earthworm are organized into groups to do different jobs.

Earthworms live in damp environments. On a normal, non-rainy day, you'll find worms in the soil where it is damp. On rainy days, you'll find worms above ground where it isn't too wet. In the soil, it is too wet on rainy days, which is why they come above ground.

Worms breathe in a unique way. They need oxygen, just like humans, but they don't have lungs. They have special skin that allows them to "breathe" oxygen right through it. Diffusion allows an earthworm to get the oxygen it needs to survive. The amount of oxygen inside the earthworm will always be less than the area outside of the earthworm. This means the lower concentration of oxygen inside causes the oxygen from the higher concentration outside to diffuse into the earthworm's skin cells.

At the same time, diffusion is occurring when the higher concentration of carbon dioxide inside the worm is diffusing outside of the cell, to a region of lower concentration.

Earthworms eat in a similar manner to humans. Worms have a digestive system where food moves into the intestines and is digested. The intestinal wall contains blood vessels that allow the nutrients in the food to be diffused into the bloodstream. The nutrients are circulated by the movement of the blood to the rest of the cells in the body.

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Curriculum Connection
B2.5

Questions

Use information from the text to support your answer.

1) What is a multicellular organism? How are their cells organized?

2) How do[illegible] worm eat and breathe?	
Ea[illegible]	
Breathe	

PREVIEW

True or False

Circle whether the statement is t[illegible]lse.

1) A multicellular organism has one or more cells.	T[illegible]	alse
2) Humans and worms are unicellular organisms.	[illegible]e	False
3) There are four types of cell tissue that cells are organized into.	True	False
4) The cells that makeup muscle have more mitochondria.	True	False
5) Worms need oxygen but do not produce carbon dioxide.	True	False
6) Worms perform a gas exchange using diffusion.	True	False
7) A worm always has higher levels of oxygen inside its cells.	True	False
8) A worm has intestines that digest food and prepare nutrients for the blood.	True	False
9) Blood carries nutrients and diffuses them into cells low in the nutrients.	True	False
10) Worms need a wet environment so they stay underground on rainy days.	True	False

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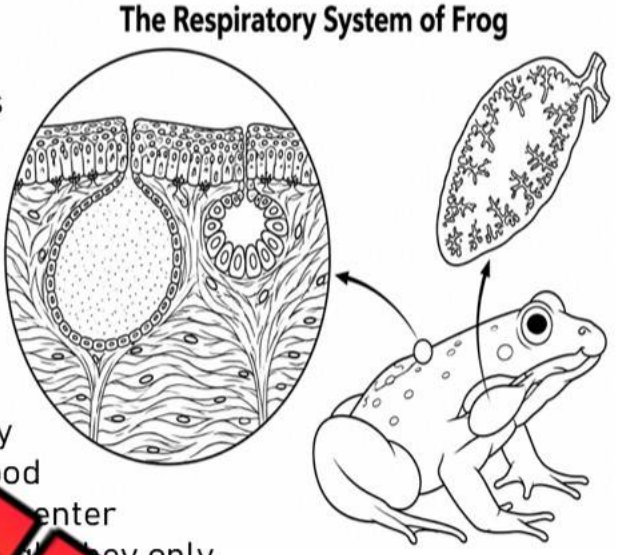
B2.5

Multicellular Organisms - Frogs

Frogs – Multicellular Organisms
A frog is a multicellular organism with more than one cell. Frogs are vertebrates as they have backbones. Frogs have many groups of cells that work together to perform certain functions that allow the frog to meet its basic needs.

Respiration
One of the [illegible]ic needs for frogs is breathing. Frogs have a uni[illegible] of exchanging gas, as they can perform [illegible]e different ways.



1) Lu[illegible]
The gas [illegible]hange[illegible]e li[illegible] humans, by using their lun[illegible] frog[illegible] can breathe in oxyge[illegible]h thei[illegible]nd into their lungs. The lungs [illegible]k li[illegible]e they oxygenate blood through [illegible] and th[illegible]lood is circulated throughout the [illegible]hat [illegible]enter the cells in the rest of the body. [illegible]ke h[illegible]ey only breathe when necessary, not continuou[illegible]

2) Skin
Frogs can actually breathe through their skin. I[illegible] most [illegible]ing a frog does is through their skin. A frog's moist skin is thin and ma[illegible]ood v[illegible] and capillaries that are close to the surface. The oxygen in [illegible] in th[illegible]er surrounding the frog get diffused into the blood because th[illegible]is s[illegible]

When frogs are in the water, this process works effortlessly. T[illegible]n has oxygen available to it through the water. However, frogs can st[illegible]ea[illegible]ugh their skin on land because they have glands in their skin that produces m[illegible]keeping them moist. If you've ever touched a frog, you've probably noticed they alw[illegible]s feel slimy.

3) Mouth
Yes, humans can breathe through their mouths as well, but we breathe oxygen through our mouths and into our lungs. So, we only use our lungs to breathe. Frogs on the other hand, actually breathe through their mouth without the use of lungs.

Inside a frog's mouth is a surface where oxygen can be diffused directly into the bloodstream. When they breathe into their mouths, the oxygen diffuses through the cell membrane and into the bloodstream, where the oxygen concentration levels are lower than the oxygen concentration levels inside the mouth. During this process, carbon dioxide is diffused from the heavy concentration in the blood, into the mouth, so it can be exhaled out into the environment.

PREVIEW

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Curriculum Connection
B2.5

Explain How does a frog breathe through each of the three respiration surfaces?

Lungs	
Skin	
Mouth	

PREVIEW

True or False Circle whether the statement is true o[illegible]



1) Frogs breathe through their mouths and into their lungs.	True	False
2) Humans perform a gas exchange in their mouths and nose.	True	False
3) Frogs breathe through their nostrils and into their lungs.	True	False
4) Frogs need to keep moist skin so they can breathe through their skin.	True	False
5) Frogs produce mucus through skin glands.	True	False
6) Gas exchange in frogs involves oxygen and nitrogen mainly.	True	False
7) Frogs breathe mainly through their nostrils and lungs.	True	False

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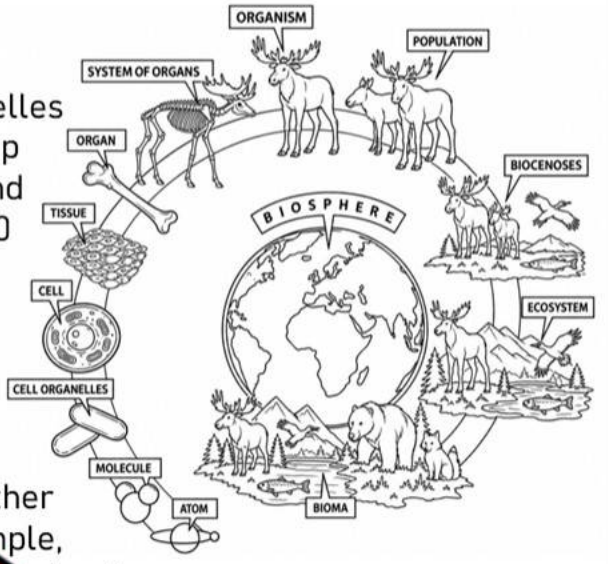
Curriculum Connection
B2.6

Levels of Organization – Cells, Tissues, Organs

Levels of Organization – Cells, Tissues, Organs, and Organ Systems
There are 4 levels of organization for living things. Starting from the most basic unit of living things to the systems that keep living things alive, there are cells, tissues, organs, and organ systems.



1) Cells
Cells are the most basic unit of life. They have organelles that functio[illegible] to keep the cells alive. Cells are made up of molecu[illegible] typical human cell, there are around 42 millio[illegible]s. Even more, there are around 30 trillion [illegible] body.

2) Tis[illegible]
Tissues a[illegible] group[illegible] cell[illegible] of the same origin that have the s[illegible] func[illegible] umans have four different type[illegible] sues.

- Connective (Bones)[illegible] together to bind the organs of t[illegible] gethe[illegible] mple, tendons and ligaments ar[illegible] ctiv[illegible] of cells.
- Epithelial (Skin) Tissue – sheets of c[illegible] cover[illegible] ior surfaces of the body, line the interior cavities and passageway[illegible] forms[illegible] nds.
- Nervous (Brain) Tissue – found in the brain, spi[illegible] ord, a[illegible] s. The cells are excitable, meaning they allow electrochemi[illegible] nals t[illegible] ate to different regions of the body.
- Muscle Tissue – have cells that are also excitable, as[illegible] ond[illegible] ulation and contract to provide movement.

3) Organ
An **organ** is a structure made up of different tissues that work togeth[illegible] to [illegible] specific functions for the body.

The heart is made of all four types of tissue. First, it has muscle tissue called the cardiac muscle. This muscle contracts when your heart beats. Secondly, The heart also has connective tissue that acts as a thin layer around the heart that provides extra protection. Thirdly, the heart also has nerve endings, which is nervous tissue. These nerve endings communicate with the brain, so the heart and brain are in sync. Lastly, the brain also has epithelial tissue that form a thin layer around the heart.

Examples of organs are lungs, the brain, a muscle, a bone, the liver, and the heart.

4) Organ Systems
An **organ system** is a collection of organs that work together to perform a similar function. Some examples of organ systems are the digestive system, circulatory system, muscular system and the respiratory system. In the digestive system, there are many organs, like the mouth, esophagus, stomach, and the small and large intestines.

PREVIEW

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Curriculum Connection
B2.6



Define What do the terms below mean? Provide examples.

	Definitions	Examples
Cell		
Tissue		
Orga		
Organ System		

PREVIEW

Question What is the relationship be[illegible]en cells[illegible]ues[illegible]ans, and organ systems?

True or False Circle whether the statement is true or false.

1) The heart is an organ system.	True	False
2) Tissues are a collection of similar cells that have the same function.	True	False
3) Organs are made of just one type of tissue.	True	False
4) The heart has all four types of tissue.	True	False
5) The brain is made primarily of muscle tissue.	True	False

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Curriculum Connection
B2.6

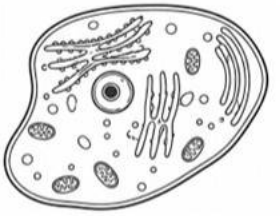
Directions Circle what the image is in the pictures below.

1)



Cell Tissue Organ Organ System

2)



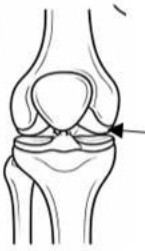
Cell Tissue Organ Organ System

3)



Cell Tissue Organ Organ System

4)



Cell Tissue Organ Organ System

5)

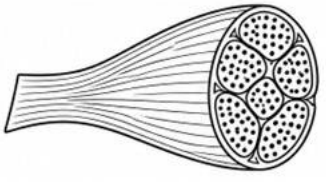


Cell Tissue Organ Organ System



Cell Tissue Organ Organ System

7)



Cell Tissue Organ Organ System

8)



Cell Tissue Organ Organ System

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Curriculum Connection
B2.6

Research – Cells, Tissues, Organs

Learn more about an organ system by researching it below. Answer the questions by learning more about the cells, tissues, and organs within the organ system. Some examples of organ systems are the circulatory system, respiratory system, muscular system, nervous system and the digestive system.



Research Answer the questions below.

PREVIEW

1) Wh[illegible] you choose to research?

2) What is the fu[illegible] the o[illegible]m?

3) Name the organs in the organ system.

4) How many organs are in the organ system?

5) Choose one organ from the organ system you chose. Write it below.

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6) What tissues is the organ made up of? Write yes or no if the organ is made of the tissues below. Describe the tissue in the organ if you answer yes.	
Connective	
Epitheli	
Muscle	
Nervous	

7) How many cells are in the organ?

8) Describe the cells in the organ or in tissues in the organ. For example, the heart has white and red blood cells.

PREVIEW

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Name: _____ 75

Activities – Diffusion, Cells, Tissues, and Organs

Word Search

Find the words from the word bank.



Diffusion	Osmosis	Concentration	Gradient	Low
High	Gas	Exchange	Unicellular	Solvent
Solut	Isotonic	Hypotonic	Hypertonic	Multicellular

N				C	E	L	L	U	L	A	R	D	A	L	V	M	R
S	C	O			N	T	R	A	T	I	O	N	R	T	T	E	G
I	I	D		U		T	E	J	F	L	V	A	N	B	G	Y	
S	N	Q	A				C	Y	P	W	E	L	E	T	N	Y	
O	O	S	N	F	N		A		E	N	T	F	U	V	U	A	E
M	T	I	P	F	O	Q		L			G	Y	L	L	A	H	C
S	O	U	E	E	T	K	J	G		E			A	L	O	R	C	K
O	S	A	R	L	R	B	S	Q	K			U			S	O	X	V
S	I	Y	S	R	E	T	E	W	S	L					Z	E	S
B	M	P	H	Y	P	O	T	O	N	I	C	K				R	E
W	W	I	P	S	Y	P	C	L	Y	P	F	T	S	N			J
N	E	V	U	X	H	I	G	H	Y	E	B	C	K	R	U		O	Q

PREVIEW

Word Scramble

Unscramble the words from the word bank.



GHXNEEAC		RCNONANEOCTIT	
NARIGTDE		FIUDFNSOI	
ENOVLST		OTUELS	
SMOSISO		GHHI	
PTOIYCNHO		LCRELULTIUMLA	

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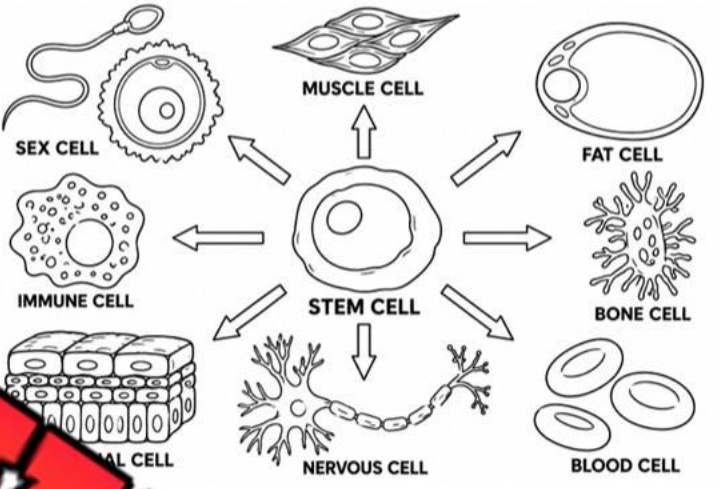
Curriculum Connection
B1.2

Stem Cell Technologies Treating Disease

What Are Stem Cells?

Stem cells are cells that have not differentiated or become specialized. They are special human cells that are able to develop into many different cell types, including muscle cells and brain cells. Stem cells are found within plants and animals. They can renew themselves again and again through cell division.

There are two main types of stem cells: embr[illegible]ic stem cells and adult stem cells.



Embryon[illegible]

Scien[illegible]m cells from embry[illegible] human [illegible] mammals. An embryo is an u[illegible] Em[illegible]nic stem cells are taken [illegible] about [illegible] old and has only 150 c[illegible]ese [illegible] be able to be used to [illegible] body.

Adult Stem Cells

Scientist can get adult stem cells much [illegible]ur bo[illegible]ve tissues that are constantly forming new cells to replace old ones. T[illegible] tissues [illegible]all number of stem cells. When scientists take these stem cells, it is believ[illegible] they [illegible] be used to form the organ that it is taken from.

Stem Cells Treating Disease

When someone has a disease, like Alzheimer's disease, th[illegible]ssu[illegible]in that is damaged. To treat Alzheimer's, stem cells can be taken so [illegible] can [illegible]w brain tissue in a laboratory. Once the brain tissue has mature cells, i[illegible] replace the damaged tissue in the brain.

In 2016, Kristopher Boesen was in a car accident that left him paral[illegible] from the neck down. After the incident, Kris could barely breathe due to his injuries, and he was told he may never move his body again. Doctors gave Kris the options of a stem cell trial, or a surgery that will help his breathing, but not his movement. Kris chose the stem cell option.

Doctors injected Kris with embryonic stem cells into his spinal cord. The plan was for the stem cells to stimulate nerve cell growth and produce blood vessels that would bring oxygen and healing to the injured site.

After just two weeks, Kris could move his arms and hands in small motions. In three months, he was able to write his name with pen and paper and accomplish a good deal of other normal daily tasks. Kris went from being completely paralyzed and immobile to being able to function on his own again.

Stem cells have been used with millions of patients globally. Their rate of effectiveness has been estimated at 82.2%. Their use in healthcare is continuing to grow.

PREVIEW

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Curriculum Connection
B1.2

Questions Use information from the text to support your answer.

1) What are stem cells? What are the two kinds of stem cells?

2) How ca lls be used in healthcare?

PREVIEW

Questioning Write 2 questions you ut t ading.

1)	
2)	

True or False Circle whether the statement is true or false.

1) Adult stem cells can be used to create any type of cell.	True	False
2) Embryotic stem cells can be used to create any type of cell.	True	False
3) Stem cells are used to form healthy tissue that replaces damaged tissue.	True	False
4) Stem cells are helping people with diseases like Alzheimer's disease.	True	False
5) The use of stem cells always works in healthcare.	True	False
6) Adult stem cells were used to heal Kristopher's spinal cord.	True	False
7) Stem cells renew themselves through cell division.	True	False

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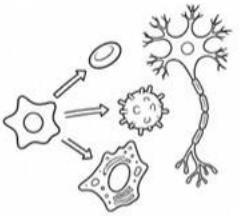
Curriculum Connection
B1.2

Research – Advantages/Disadvantages of Stem Cells

The use of stem cells in healthcare is relatively new, with the first treatment being done in 2010. Therefore, scientists are still learning about the advantages and disadvantages of using stem cells. Learn more about these advantages and disadvantages by answering the questions below.



Advantages

Jot down the advantages of using stem cells. You do not need to use full sentences.

Advantages

PREVIEW

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Curriculum Connection
B1.2

Disadvantages Jot down the disadvantages of using stem cells. You do not need to use full sentences.

Disadvantages

PREVIEW

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Curriculum Connection
B1.2

Cellular Agriculture – Cultured Meats

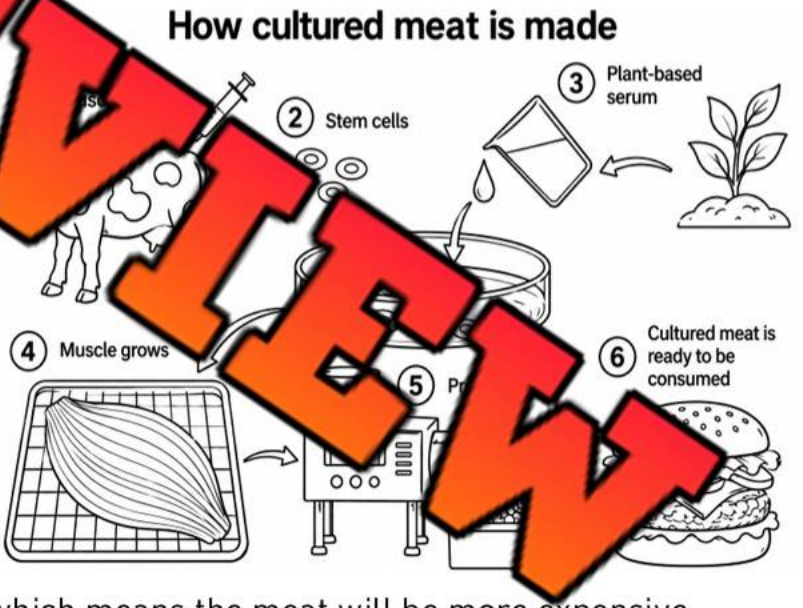
What is Cellular Agriculture?

Cellular agriculture is the field of agriculture that produces animal products like meat, dairy and even products like leather, directly from cells instead of raising animals for these exact same products.

Ahmed Khan is the owner of the Canadian non-profit organization named CellAgri. Ahmed sums up the science behind cellular agriculture:

"Instead of [r]ing, let's say – a cow, from birth for the meat, dairy and leather, you take cells and t[r]se cells to produce the same products. One of the products that can be made thr[o]griculture is meat. The way that works is you take a biopsy, a small injecti[o]ay a cow, and from that biopsy there are cells in that called stem cells, [t]hose are[ ]have the ability to divide into more cells, as well as specializ[i]g and d[i]g – becoming different types of cells, like muscle cells and fat cells and other [t]s yo[u] in meat products. Those stem cells are then put into a nutrient formula[ ]d the [ ]media and, at scale – the stems cells and the cell culture media are pl[a]n a large bio-reactor, and th[e] that would be a cell-cultur[e]d product or what I call cell-base[d] meat."

PREVIEW



Use of Cell Cultured Meat

As of 2022, lab-grown meat is not for sale in grocery stores in Canada. However, the cultured meat has been approved in Singapore, and is being sold successfully there. Experts believe cell cultured meat will be sold in Canadian stores by 2025, and it could be much sooner than that.

Disadvantages of Cell Cultured Meat

- It is costly to complete the process, which means the meat will be more expensive
- It is very time consuming as the stem cells need time to divide repeatedly to become substantial muscle tissue
- Quality control could be problematic as this is a new technology and the process has not been perfected yet, which means changes to the process could lead to poorer quality meats

Advantages of Cell Cultured Meat

- We will not need to kill animals for human consumption
- It is more sustainable, as livestock farming contributes massive amounts of greenhouse gases that are causing global warming
- Farms take up a lot more space than laboratories. It is estimated that the same amount of meat could be made in laboratories using 1% of the land needed for livestock farming.

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Curriculum Connection
B1.2

Questions Use information from the text to support your answer.

1) What is cellular agriculture and cultured meat?

2) How is meat made?

PREVIEW

Explain What are the advantages and disadvantages of cultured meats?

Advantages	Disadvantages

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Curriculum Connection
B1.2

Using Cultured Meats – Multiple Perspectives

When new technologies arise, there are always different opinions on how the technologies will impact society and the environment. Read about the new technologies below and explain what you think the point of view would be of the different groups.

Explain What would be the perspective of each group below?



Cultured [illegible] will be sold in grocery stores in Canada soon.	
An[illegible]ls (Pigs, Cows and Chickens)	
Livestock Farmers	
Environmentalist (People who care a lot about the environment)	
Average Person in Canada	

PREVIEW

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Curriculum Connection
B1.2

Using Stem Cells – Multiple Perspectives

Explain What would be the perspective of each person below?



Stem cell treatments are free for Canadians, but cost us in our taxes. In the USA and around the world, treatments cost people $25,000 per treatment or more.

Sick p…	
Sick patients in the USA or in other countries without free healthcare	
People who will never use stem cell treatments and pay high taxes	
People who oppose using Embryotic Cells	

PREVIEW

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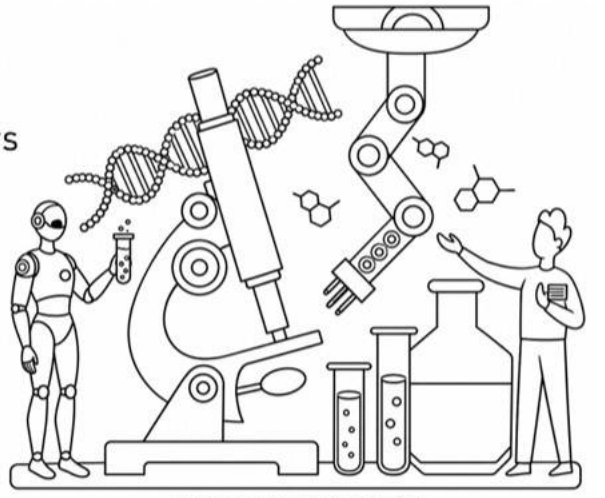
Curriculum Connection
A2.1, A2.2, A3.1, A3.2, A3.3

Coding – Cell Sample Automation

Need For Cell Automation

Right now, much of the work done with cells is done manually, meaning scientists have to perform the work themselves. The processes below are done by biologists:

- Taking the cell sample
- Preparing the samples for storage
- Storing cell sample in airtight refrigerators
- Examining cell under a microscope



BIOTECHNOLOGY

Many [illegible] are time sensitive, meaning scientists must be present throughout the process. For example, after collecting the sample, it must sit for 12 hours before being prepared. After which it may need to [illegible] for 12 hours before being examined.

Considering this, a biologist's life is dedicated to the science laboratory. Many end up needing to go into the laboratory on weekends and holidays and cannot take vacations.

It is also a slow and inefficient process where mistakes can be made because of user-error. If the biologist doesn't perform the correct step at the right time, their sample could be ruined.

Cell Sample Automation

Many of the processes above can be performed automatically by robotic arms can be used to move cell samples to where they need to go [illegible] much time has elapsed.

Coding and robotics can improve the efficiency of laboratories by eliminating user-errors. Computers do not make errors because they get busy or tired. Instead, proper coding ensures jobs are done on time and properly. A coding block such as the one below could perform some of the functions above.

Defined Counts

set [time] between moving [cell sample] to fridge at [10 hours]

if [time] reaches 10 hours

then move cell sample to fridge

PREVIEW

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Curriculum Connection
A2.1, A2.2, A3.1, A3.2, A3.3

True or False

Circle whether the statement is true or false.

1) Doing things manually means machines do the work automatically.	True	False
2) Doing things manually means people do the work themselves.	True	False
3) Biology laboratories are becoming more automated.	True	False
4) Machines can do work more efficiently with less mistakes.	True	False
5) Machine[illegible] more mistakes than humans.	True	False

Ques[illegible]

[illegible]uestions below using evidence from the text.

1) How is techn[illegible]ing im[illegible]logy and the study of cells?

2) How is cell sample automation helping [illegible]iologist[illegible]

PREVIEW

Directions

Finish the If/Else statements below for a cell sample aut[illegible]on system.

Defined Counts

set [time] between [cell refrigeration] and cell analysis to [24 hours]

set email of [scientist1] to [ilovecells@biologylab.com]

if [time] reaches 24 hours

then move cell sample to under microscope and take pictures

email pictures to [scientist1]

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Curriculum Connection
A2.1, A2.2, A3.1, A3.2

STEM Assignment – Creating a Machine

Create your own machine that uses robots to do the following tasks

- Take a cell sample
- Put the sample inside a container
- Storing the cell sample in airtight refrigerators
- Examining the cell under a microscope

Your machine should do each of the tasks above automatically. The machine will need to have a fridge, a for storage containers, needle for taking samples, and microscope to examine the sample.

You will need to set times between the tasks. How long should the machine wait before sending the sample to the next stage?

PREVIEW

Defined Counts

Set the times on each task below. Fill in the if/then statements.

Defined Counts

set time1 between me [ ] to fridge to [ ]

set time2 between cell refrig ion [ ] cell a sis to [ ]

set email of scientist1 to [ ]

if cell sample is taken

then put sample inside a [ ]

If time1 reaches [ ]

then [ ]

If time2 reaches [ ]

Then [ ]

email pictures to [ ]

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Curriculum Connection
A1.1, A2.2, A3.2

Questions Answer questions about your machine.

1) How will your machine help biologists?

2) How do[illegible]ur machine work? Describe each of the steps.

3) What is a defined count? Exp[illegible]ow [illegible]re data for the computer to use later.

4) Does your machine do things automatically or manually? Explain how that leads to more efficiency and less errors.

PREVIEW

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Curriculum Connection
A3.1, A3.2

Draw Draw your machine below. Make sure to include the tools your machine has.



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Curriculum Connection
A1.1, A3.2

STEM Math connection – find out the financials for your invention.



1) How much will one unit of your invention cost you to make?

2) How many units will you make at first?

3) How much will the machines cost you in total?

4) How much will you sell one machine for?

5) How much money will you gross (earn) if you sell 10,000 units? For gross earnings, do not factor in the cost of each machine.

6) How much net profit will you earn if you sell 10,000 units? For net profit, you'll find the gross and subtract the cost to build the 10,000 units.

7) If you want to make $10 million in net profits, how many units will you need to sell?

PREVIEW

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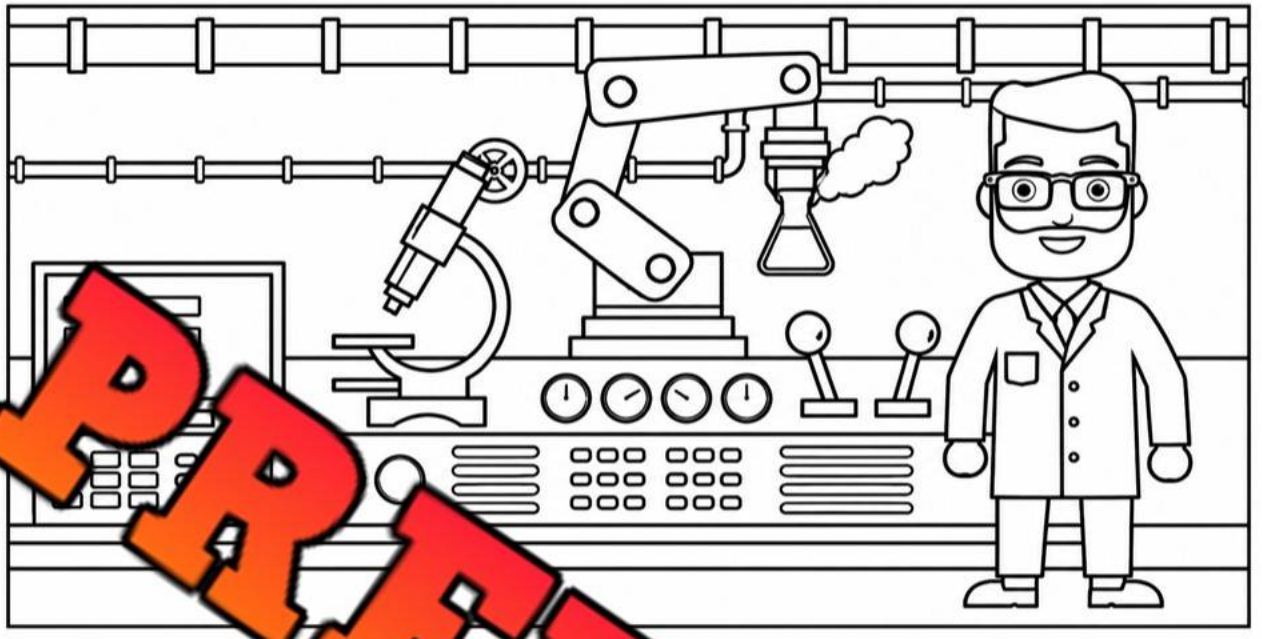
Curriculum Connection
A3.2

Programming a Robot Lab Assistant



PREVIEW

Coding Above is a picture of [illegible] lab assistant. Fill in the table below.

1) What do the buttons do on Dr. Nathan[illegible]obot assistant? W[illegible]t least 3 things that this robot machine does.	
Button 1	
Button 2	
Button 3	
2) Write if/then statements for the three buttons above. For example, if red button is pressed, then robotic arm dumps a sample from beaker under microscope.	
Button 1	
Button 2	
Button 3	

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Curriculum Connection
A2.1

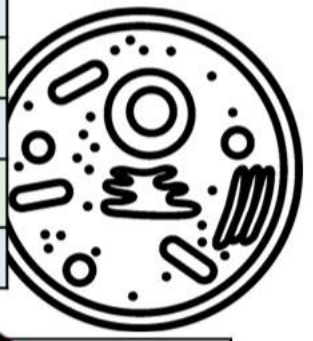
Coding – Drawing a Cell Using Loops

Draw Draw an animal cell below using the coding instructions.

- Draw a large circle – cell membrane
- Draw a nucleus in the centre
- Draw a small circle inside the nucleus – nucleolus
- Repeat 3 times
  - Draw a lysosome (small circle)
  - Draw a vacuole – misshaped circle
  - Draw a Golgi apparatus
  - Repeat 4 times
    - Draw a mitochondria (peanut shape)
  - Repeat 6 times
    - Draw a centriole
- Draw a smooth endoplasmic reticulum







PREVIEW

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Curriculum Connection
A2.1

Draw Draw a plant cell below using the coding instructions.

- Draw a large rectangle – cell wall
- Draw a nucleus at the top
- Draw a small circle inside the nucleus – nucleolus
- Repeat 3 times
  - Draw a chloroplast – tube shaped
- Draw a la… uole – misshaped rectangle
- Draw a…
- Rep… mes
  - Draw a…
- Repeat 6 times…
  - Draw a mitoc… d…
- Draw a smooth endoplasm… um
- Draw a rough endoplasmic reticulum

1) What is a loop in coding?

2) How does using a loop help programmers use less lines of coding?

3) How many lin… de did the programmer…

4) If the programmer who wrote this code didn't use loops, how many lines of code would they have to use?

PREVIEW

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Activities – Cell Technologies



Word Search

Find the words from the word bank.

Electron	Microscope	Optical	Photon	Magnify
Technology	Disease	Treatment	Stem	Cell
Culture	Meat	Perspectives	Tissue	Health

PREVIEW

Word Scramble

Unscramble the words from the word bank.



TONHPO		YIGAMFN	
CLUDETRU		NCELROTE	
ETTRMTNEA		CLLE	
TLIACOP		ESRSEIPCVTPE	
TEAHLH		IESASDE	

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Name: _____ Date: _____

Unit Test - Cells

Multiple Choice /10

1) Which is smallest? a) Organs b) Cells c) Tissues d) Organ S[illegible]m	2) Cells are... a) Living b) Non-living c) Minerals d) Vitamins
3) Which o[illegible]is the powerhouse of the cell? a) Cy[illegible]m b) Vacuole c) Nucleus d) Mitochondria	4) Which organelle is the command centre of the cell? a) Cytoplasm b) Vacuole c) Nucleus d) Mitochondria
5) Which type of solution do[illegible]al [illegible] prefer? a) Isotonic solution b) Hypertonic solution c) Hypotonic solution d) None of the above	[illegible]ich type of solution does a plant cell [illegible]? a) Isot[illegible]tion b) H[illegible]tonic c) [illegible]toni[illegible] d) None [illegible]ove
7) In an animal cell, the nucleus is located... a) Near the centre b) On the top c) Near the edge d) On the bottom	8) Vacuoles a[illegible]ger a) Plant cells b) Stem cells c) Animal Cells d) None of the above
9) Plant cells have which organelle that animal cells do not have a) Cytoplasm b) Nucleus c) Cell wall d) Mitochondria	10) In diffusion, molecules move from areas of ___ concentration to areas of ___ concentration a) High to low b) Low to high c) High to high d) Low to low

PREVIEW

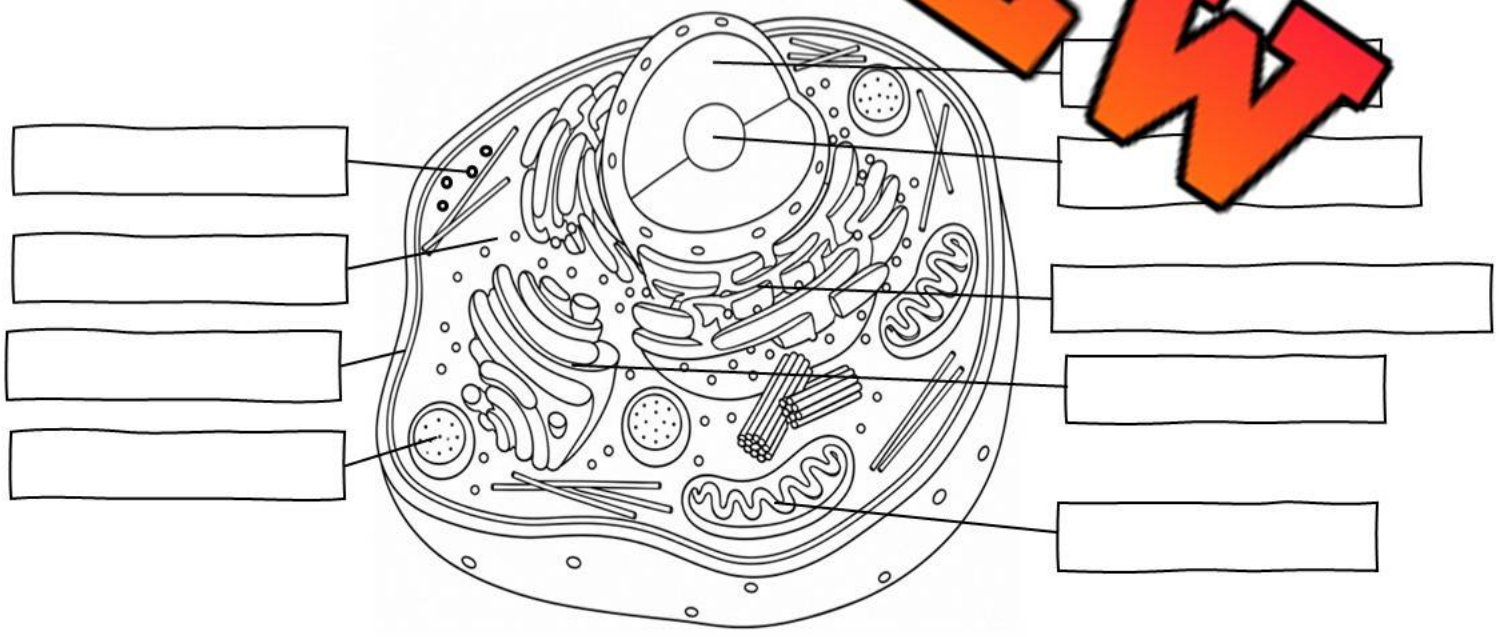
Definitions – What does the term mean? (1 mark each) /4

Term	Definition (what does it mean)
Cell	
Unicellular Organism	
Cell Tis	
Organelle	

PREVIEW

Label the diagram of the a bel

Ribosome	m	Cell Membrane
Golgi Apparatus	Nucleus	Nucleolus
Mitochondria	Lysosome	ic Reticulum



Long Answer (5 marks each) **/10**

1) What is the role of diffusion in cells? Give examples, including the gas exchange that occurs in humans/frogs.

2) How have technologies in cell res lped e? You can reference stem cells or the use of microscopes in yo nswer.

PREVIEW