Preview - Information

Thank you for your interest in this Mega Bundle. This product contains multiple Workbooks and Google Lesson Slides. Within this preview, you will see:

- ✓ A selection of Ready-To-Use Google Lesson Slides for each unit.
- ✓ A selection of worksheets included in each workbook.

When you make a purchase, you will receive a folder that contains each of the .pdf workbook files and links to where you can make copies of the Google Lessons units to your Google Drive.

Thank you for shopping with us. Please let us know if you have any questions at:

rob@supersimplesheets.com

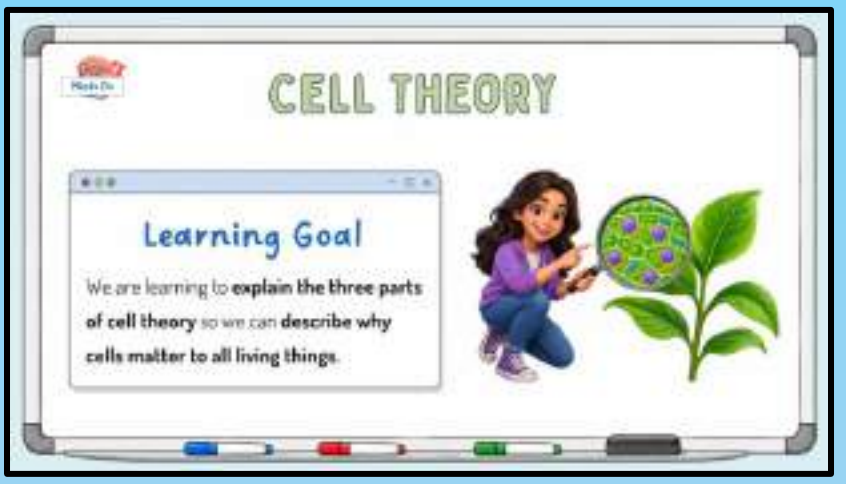
Google Slides Lessons Preview

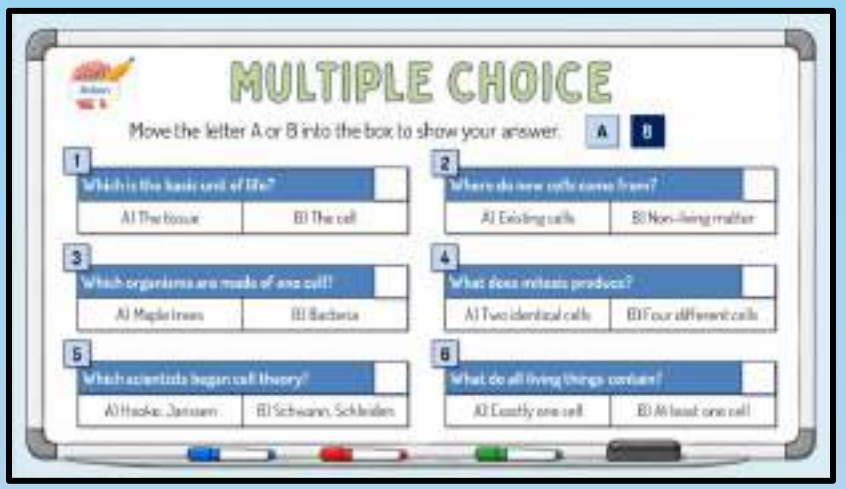
© Super Simple Sheets

Ontario Science Curriculum
Cells– Grade 8

3-Part Lesson Format

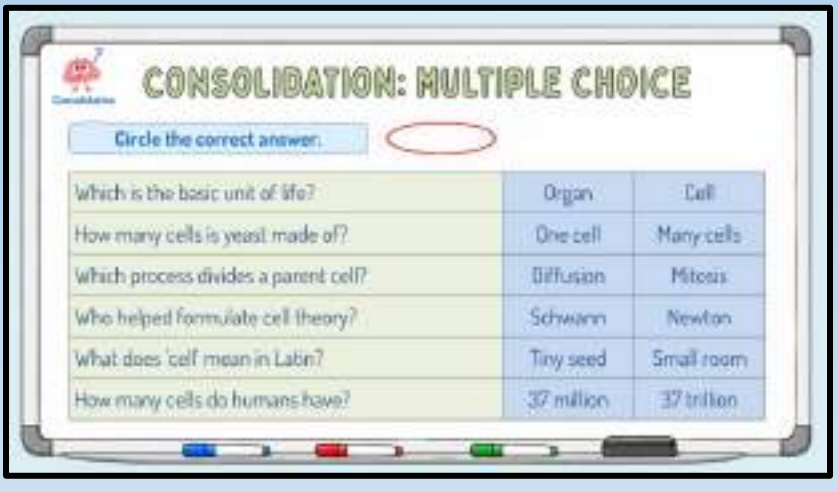
Part 1 – Minds On!
- Learning Goals
- Discussion Questions
- Quotes
- And More!



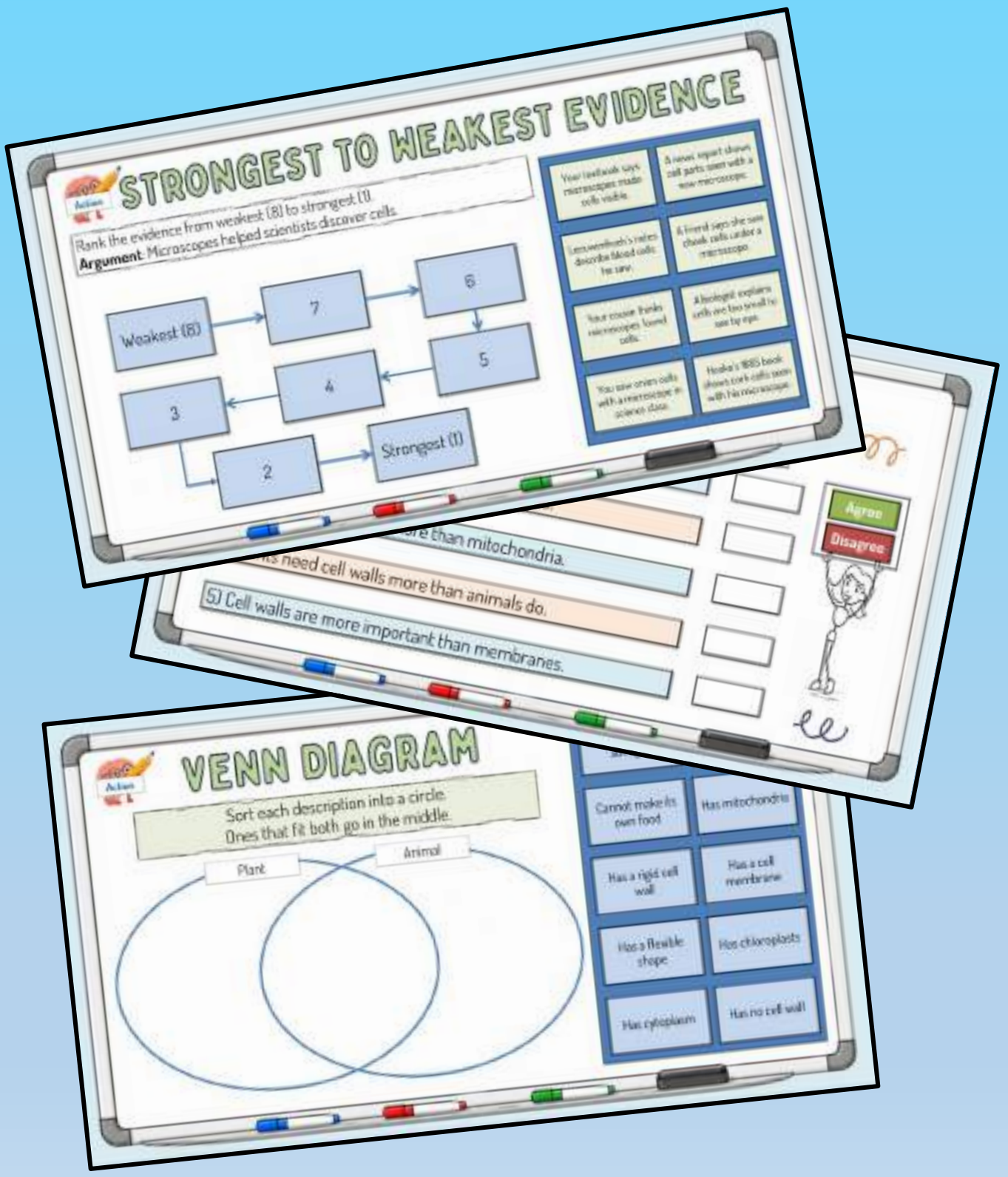


Part 2 – Action!
- Writing
- Matching
- Drag and Drop
- Drawing
- And More!

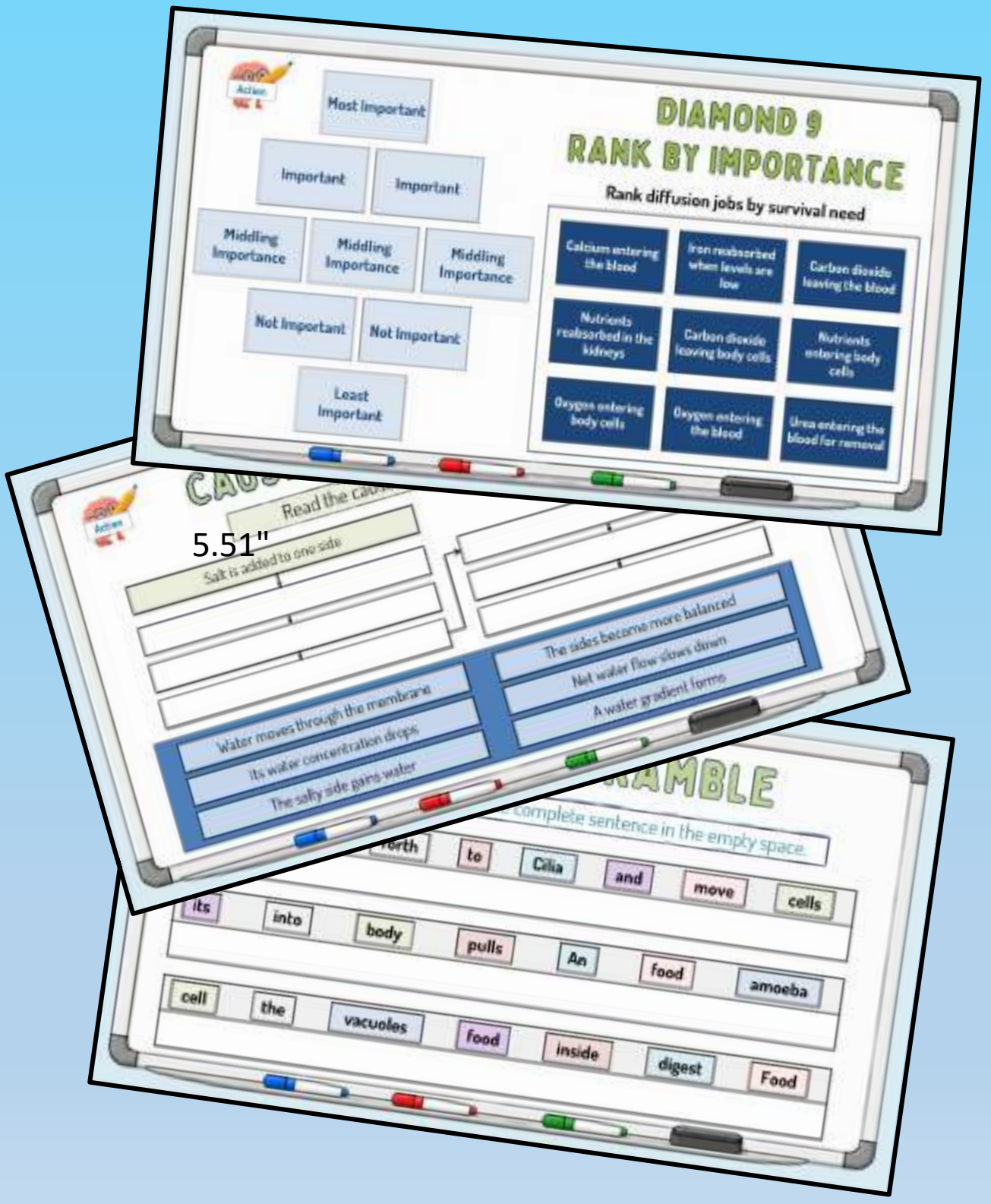
Part 3 – Consolidation!
- Exit Cards
- Quizzes
- Reflection
- And More!



Ontario Science Curriculum
Cells– Grade 8



Ontario Science Curriculum
Cells– Grade 8



5.51"

Name: _____ 6

Curriculum Connection
B2.1

Cell Theory

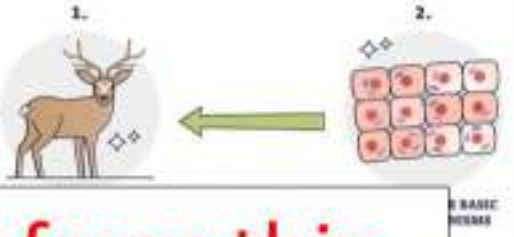
What are Cells?

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 Theory

In the mid-nineteenth century, **cell theory** was first formulated by Theodor Schwann and Matthias Schleiden. They created three parts to the theory, that explained the importance of cells to life.



1)
2)
3)

Preview of 55 pages from this product that contains 126 pages total.

The

The
like
its f

smallest unit of life that provide the building blocks for living things.

All Cells Come From Pre-Existing Cells

All life comes from pre-existing life through the process of reproduction. This means that living things are needed to create more living things. For example, plants create 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.

Name: _____ 7

Curriculum Connection
B2.1

Cell Theory

Questions

Use information from the text to support your answer

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

2) What is the difference between humans and unicellular organisms?

PREVIEW

Summarize

What does 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

© Super Simple Sheets

Name: _____ 8

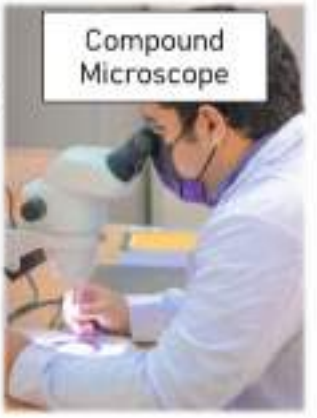
Curriculum Connection
B1.1

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 en of a tube to provide a small magnification effect. It wasn't until 1609 that Galileo Gal nted the first microscope. Zacharias Janssen is also credited with making o arliest compound microscopes around the year 1600. A **compound micros** es. These early microscopes could magnify an object up to 20 or 30 ti normal


Compound Microscope

An ie van ek made microscopes by grinding his own lenses. His sc ere more like magnifying glasses, as they only had But t quality lenses could magnify an object by up to 2 es. uwenhoek to observe animal and plant tissue, b mine d fossils. It allowed him to see things no one had n b

Today, modern microscope n pr nification of 1000x. An **optical microscope** uses light stem es to generate magnified images of small obj An eye pro s a slight magnification, say 10x and the objective le ides magnification of 100x, which gives a total magni of 1 r magnification could be created, but the power of the light become fac e higher magnification does not show any more details.

Importance of the Microscope

Microscopes have created an entirely new dimension of science. Be es, no one knew about cells because we couldn't zoom in and magnify our vision 5, 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

Name: _____ 9

Curriculum Connection
B1.1

Microscopes



Questions

Use information from the text to support your answer

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

2) Why is [illegible]tion of a microscope important? How has the magnification increa[illegible]e [illegible]s microscopes have been innovated?

PREVIEW

Summarize

Describe [illegible]e eve[illegible]e [illegible]icroscope



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

© Super Simple Sheets

Name: _____ 10

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
ensity Control		Light	



PREVIEW

Name: _____ 12

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 ac ities. These activities include growth of the cell, metabolism, protein synthesis, a roduction (cell division).

Cell Mem Membrane
The c protection for the cell. It provides a fixed environment inside the cel contai r organelles. The cell membrane has many functions, including trans ts the cell and transporting toxic substances out of the cell. The cell me made a, hence why it is often called the plasma membrane.

PREVIEW



Cell Wall
The **cell wall** surrounds the c ra and provides the cell with shape, upor protection. A cell wall is **semi-permeab** meaning molecules can pass in and out e 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.

© Super Simple Sheets

Name: _____ 13

Curriculum Connection
B2.2

Organelles in Cells

Questions

Use information from the text to support your answer

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

2) Do pl[illegible]s have the same organelles? Explain.

PREVIEW

Explain

What [illegible]ctio[illegible] of the organelles below?

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

Name: _____ 16

Curriculum Connection
B2.2, B2.3

Plant 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	

© Super Simple Sheets

Name: _____ 18

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.
	[illegible]	B) Found inside the nucleus and is responsible for making the cell's ribosomes.
	G[illegible]	[illegible]Only found in plant cells. Surrounds the cell membrane [illegible]vides the cell with shape.
	Cell Membra[illegible]	[illegible]he c[illegible]d centre of the cell that stores the cell's [illegible]and [illegible]ll the cell's activities
	Nucleolus	E) Tran[illegible]ition sy[illegible]r[illegible]e cell
	Mitochondria	F) Gel-like fluid i[illegible]th[illegible]onsible for holding the organelle[illegible]tecting [illegible]rom damage.
	Cell Wall	G) Sacs that take in waste pro[illegible]acts[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

PREVIEW

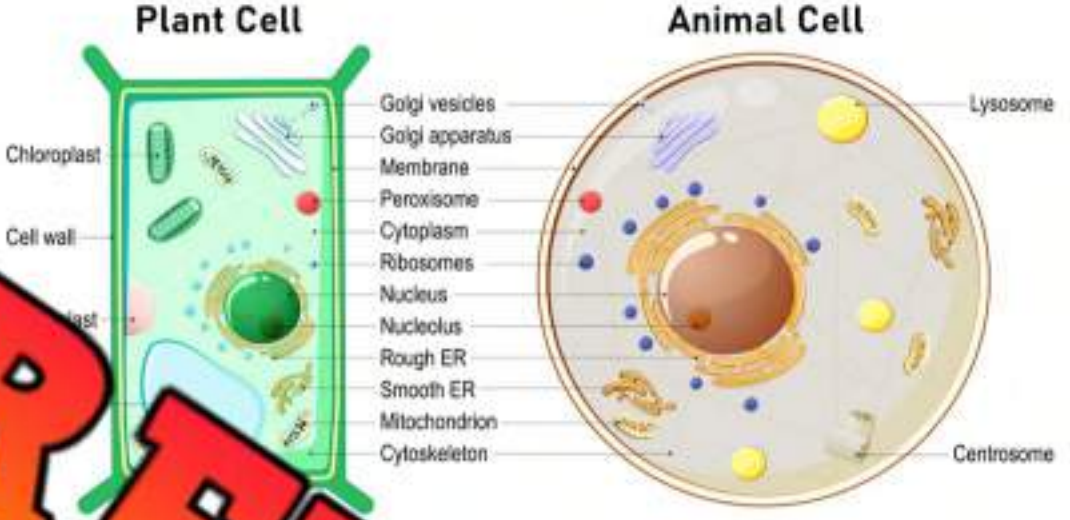
Name: _____ 19

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



Name: _____ 21

Curriculum Connection
B2.3

Plant and Animal Cells



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

Feature	Animal Cell	Plant Cell
Cell Size		
Cell S		
Vacuoles		
Cell Wall		
Chloroplasts		
Nucleus Location		

PREVIEW

Summarize Write a summary of the differences between anim cells

© Super Simple Sheets

Name: _____ 22

Curriculum Connection
B2.3

Plant or Animal Cell?

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

© Super Simple Sheets

Name: _____ 25

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 othe

The ting of these substances is passive. **Passive transport** is a naturally occurring at does not require the cell to use energy to accomplish the mover

PREVIEW

What is sion?

Diffusion is the mo les from areas of higher tion to lower concentration so th g rec throughout. An example f in sc when we spray perfume. Th ratio perfume is highest in the bottle owe edges of the room. The perfume vapour se, or spread out from the bottle and gradu ore pe from the bottle will smell the scent as it spreads.

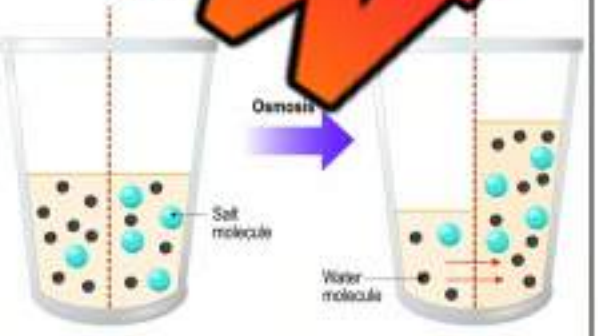
Diffusion



Diffusion helps in the movement of substa and For example, when our blood becomes oxygenated, oxygen is diffusing d needs oxygen so it can deliver oxygen to cells throughout the body. T mole re moving from high concentrations in the blood, to low concentratio ghout 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.

Name: _____ 26

Curriculum Connection
B2.4

Diffusion and Osmosis in Cells

Questions

Use information from the text to support your answer

1) Define the terms below.

Term	Definition
Semiperm able Memb	
Osmosis	

PREVIEW

2) Give an example of when e diffusion.

3) Why do cells require diffusion? Does it require e from the

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

© Super Simple Sheets

Name: _____ 27

Curriculum Connection
B2.4

Factors Affecting Diffusion

What Factors Affect Diffusion?

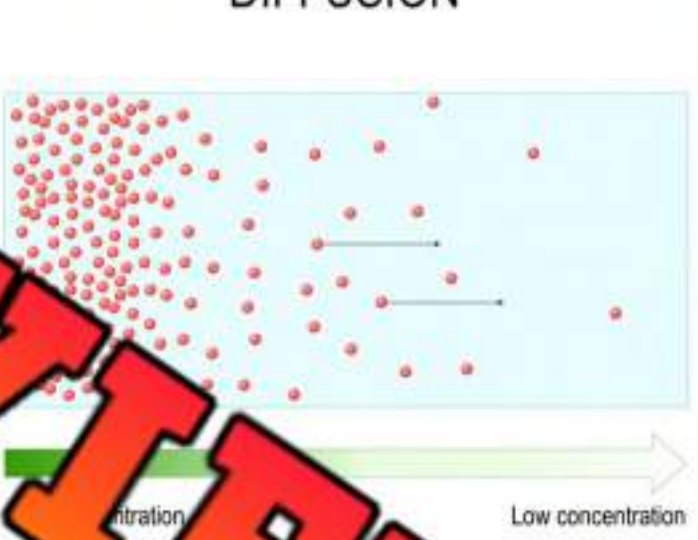
The **rate of diffusion** is how fast molecules are transported in and out of cells. There are three factors that affect the rate of diffusion.

1) The concentration gradient
2) The temperature
3) The surface area of the cell membrane separating the different regions

PREVIEW

1) The Concentration Gradient

The gr[illegible] between concentrations, the[illegible] the rate of diffusion. For exa[illegible] you drop food colouring into [illegible] drop [illegible] colouring diffuses [illegible] e wa[illegible] colouring is highly co[illegible] water has no concentrati[illegible] colouring. So, the diffusion is [illegible] th[illegible] food colouring particles spread [illegible] thr[illegible] the water. The food colouring will be li[illegible] in colour once its particles are spread out.



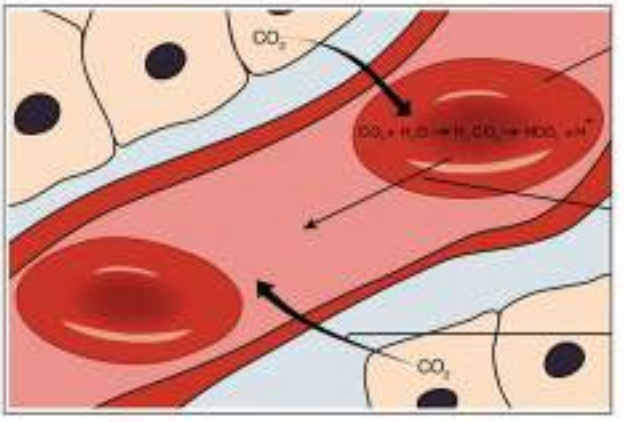
If you pour a lot of food colouring into a small amount of water, the difference between concentrations will be even greater, causing [illegible]er rate of [illegible]ion.

2) The Temperature

The higher the temperature, the more kinetic energy the molecule[illegible]ons they will move faster and have a faster rate of diffusion. If you drop a te[illegible]n cold water, the diffusion of the tea bag molecules will be slower than if you [illegible] it into hot water.

3) Surface Area of Cell Membranes

When substances are moving through semipermeable membranes, the greater the surface area between the two regions, the faster the rate of diffusion will be. In the picture, you'll notice carbon dioxide is being diffused from the cells and into the blood cells. The greater the surface area of the cells and blood cells will speed up diffusion.



© Super Simple Sheets

Name: _____ 28

Curriculum Connection
B2.4

Factors Affecting Diffusion

Questions

Use information from the text to support your answer

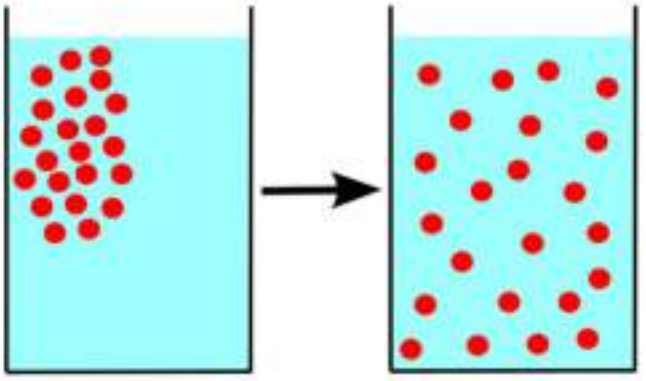
1) What does diffusion rate mean? Give an example of diffusion and describe the diffusion rate.

2) How does tem fe he diffusion rate?

PREVIEW

Diagram

Describe the diagr ow



True or False

Circle whether the statement is true or false

1) The greater the surface area between cells, the slower the diffusion	True	False
2) The greater the temperature, the faster the rate of diffusion	True	False
3) If one concentration is high and the other is low, the diffusion will be fast	True	False
4) A tea bag in boiling water will diffuse slowly	True	False
5) Carbon dioxide is diffused from blood cells into cells throughout the body	True	False

© Super Simple Sheets

Name: _____ 29

Curriculum Connection
B2.4, B2.5

Diffusion in Cells

Diffusion in the Human Body

The process of diffusion is critical to the survival of the human body. Diffusion happens when we breathe and eat. Diffusion is also the process that ensures our body has the right amount of nutrients. Our blood is an important part of diffusion as it is used to send nutrients and receive waste.

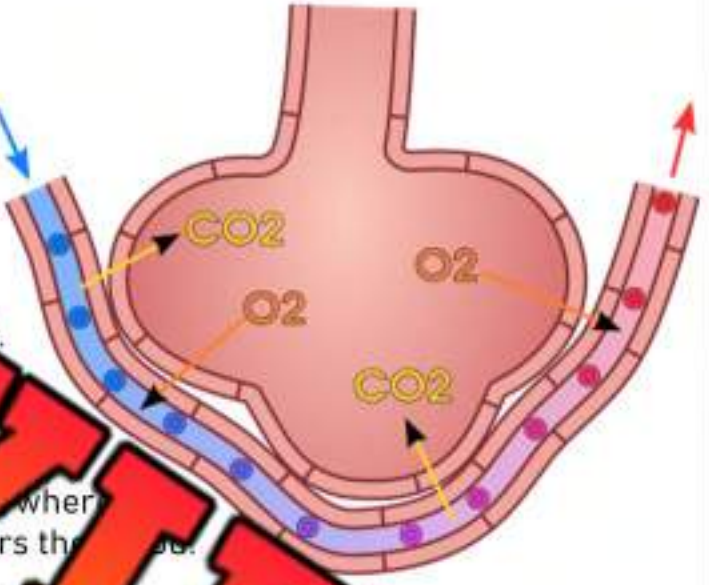
Read below about 5 ways diffusion is used by cells in our body.

Examples of Diffusion in the Human Body

1) Breathing

When you ath, thank diffusion! When you br ly gets into your blood molecules are diffused the d blood.

The gas pen use the air in the lungs h er co of oxygen than that of t yge d. The blood also has a high ration carbon dioxide, and the lung ow concentration of carbon dioxide co gradient allows for a gas exchange by d wher carbon dioxide exits the blood and oxyg ters th



2) Calcium

We need calcium for many reasons, not just for o es have enough calcium in our bloodstream, our thyroid gland secrete al caus bones to release calcium. The calcium released is diffused into our lls.

3) Kidneys

Our kidneys filter dangerous chemicals from our bloodstream throu tubes called nephrons. These nephrons separate blood from waste chemicals a s. The toxins and waste chemicals cannot pass through the cell membranes, so th are collected and removed in our urine.

The remaining good nutrients in our blood are reabsorbed by our bodies through diffusion. The amount that is reabsorbed depends on how much of that nutrient is in our blood already. For example, if you have had a lot of iron already in your diet today, the extra iron in your blood will not be diffused because the concentration amounts are the same. The extra iron becomes waste and will end up in our urine.

4) Liver

Our liver has an important job of synthesizing proteins, which we need because our body is made of them. In the process, a dangerous waste product is made called urea. The good news is that the urea is diffused into the bloodstream just upstream from the kidneys. The kidneys are able to filter the urea, so it ends up in our waste.

PREVIEW

Name: _____ 31

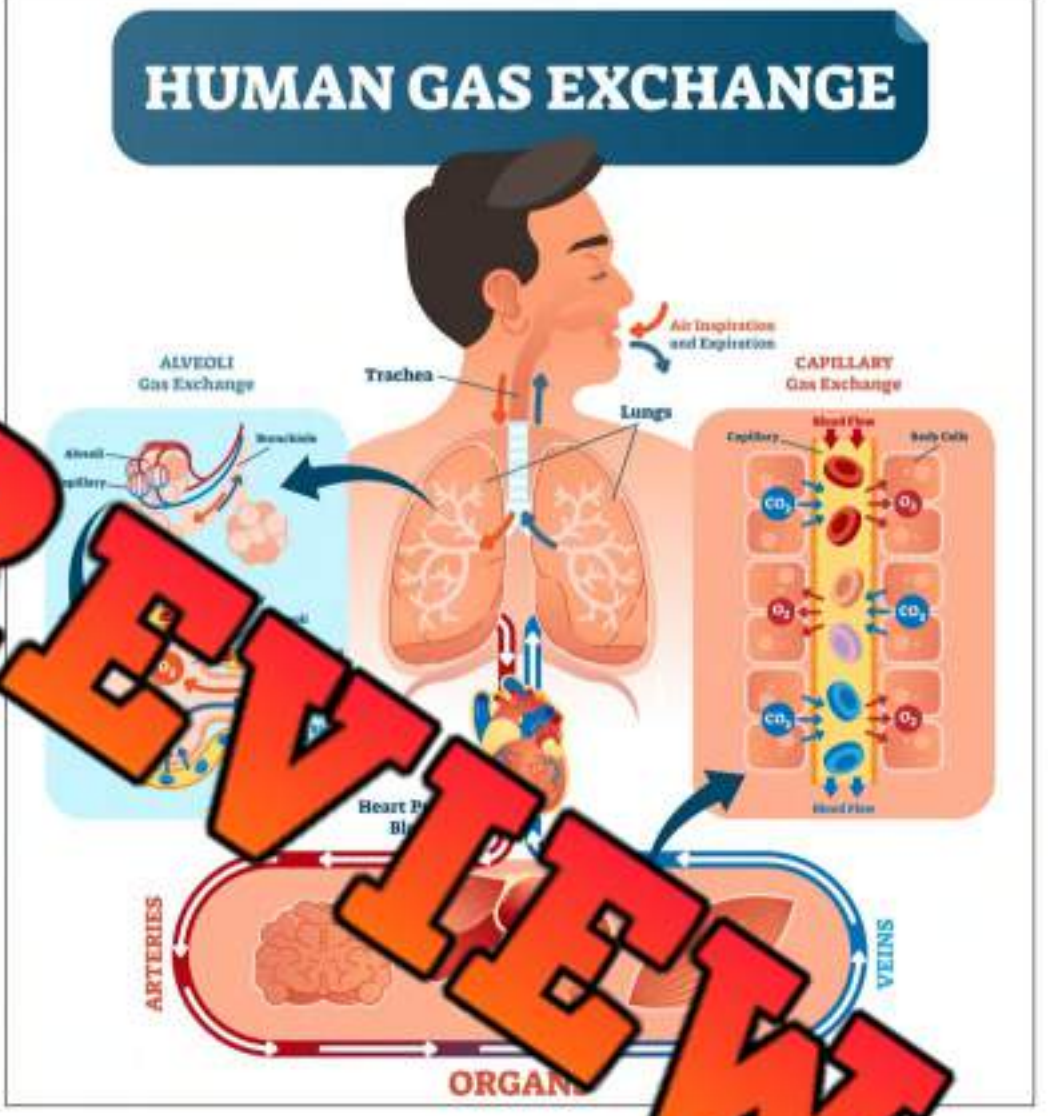
Curriculum Connection
B2.4, B2.5

Diffusion in our Respiratory System

Diffusion in our Respiratory System
The respiratory system works with the circulatory system to complete the human gas exchange.

The **human gas exchange** is a vital process of taking in oxygen for our cells and removing carbon dioxide waste that 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 diagram

© Super Simple Sheets

Name: _____ 32

Curriculum Connection
B2.4

Solvent vs Solute

Solutes and Solvents

A **solute** is the substance that is being dissolved into the other substance. Salt is a solute because it dissolves into water. A **solvent** is the substance that dissolves the solute. Water is a solvent because it allows the salt to dissolve into it.

Homogeneous Solution vs Heterogeneous Mixture

A **homogeneous** solution is a mixture where the components that make up the mixture are uniformly distributed throughout the mixture. A **heterogeneous** mixture means we can see the substances separated in the container. The one substance has not dissolved, meaning it is a heterogeneous mixture and not a solution.

PREVIEW

Label the Diagram



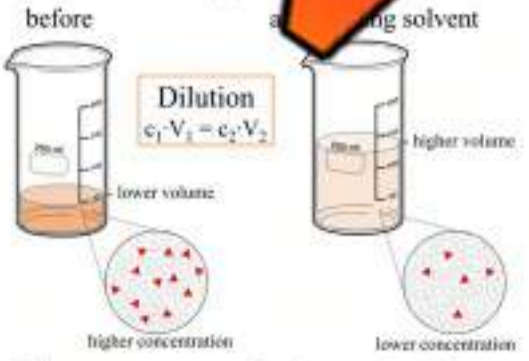
Word Bank

Solution Solute Solvent Heterogeneous Homogeneous

Dissolving

All solutions are made of a solvent and a solute. For a mixture to be a solution the solute needs to dissolve into the solvent. When we make a mixture of substances, we do not always get a solution because sometimes the solute will not dissolve into the solvent.

Dissolving happens when the larger crystal of molecules within a solute breaks up in smaller groups or individual molecules. This break down of molecules is a result of coming in contact with the solvent. The molecules then spread out more evenly and mix with the molecules within the solvent. This leads to a homogeneous solution that all looks the same.



The concentration of the solution is a measure of the amount of solute that has been dissolved in a given amount of solvent. A highly **concentrated** solution will have a relatively large amount of solute in the solvent. A **diluted** solution will have relatively small amounts of the solute in the solvent.

© Super Simple Sheets

Name: _____ 33

Curriculum Connection
B2.4

Solvent vs Solute

Questions

Use information from the text to support your answer

1) What is the different between a solute and a solvent? Give an example.

2) What is [illegible]ence between a concentrated solution and a diluted solution? Give an example

PREVIEW

Explain

In the picture, red [illegible]od c[illegible]ded to water. Describe the solution, solvent, solute, concentrati[illegible]e, and dilution levels.



Solution	
Solute	
Solvent	
Concentration Level	
Dilution Level	

© Super Simple Sheets

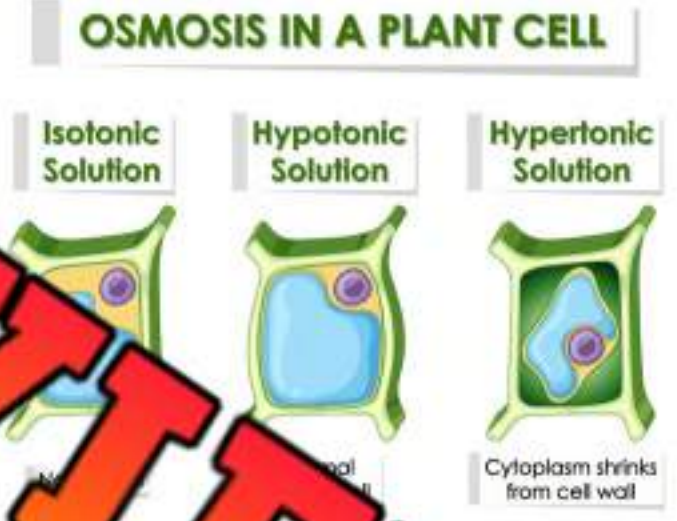
Name: _____ 34

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 in which 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 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 there is more water entering 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

Name: _____ 35

Curriculum Connection
B2.4

Osmosis in Cells

Questions

Use information from the text to support your answer

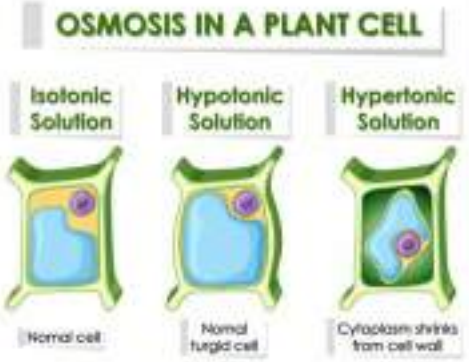
1) What is the optimal conditions for an animal cell to be in? Why?

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

PREVIEW

Explain

What is happening to the cell 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 an 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

© Super Simple Sheets

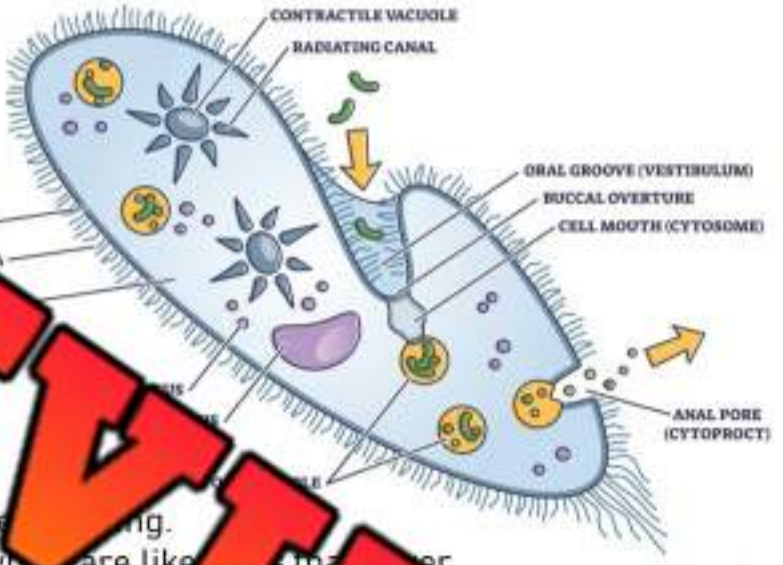
Name: _____ 36

Curriculum Connection
B2.5

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



Paramecium

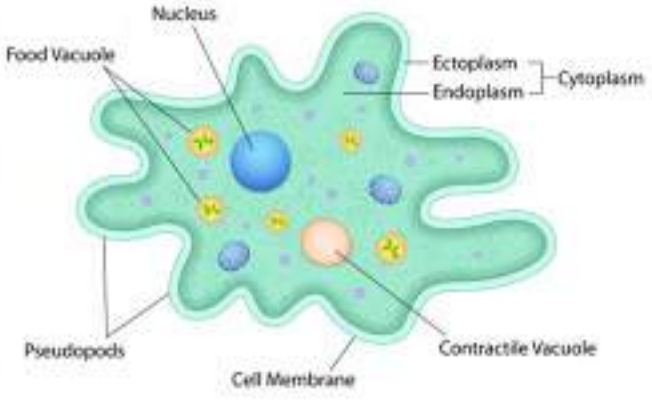
A paramecium is a slipper-sha[PREVIEW] organism that has only o[PREVIEW]hat is found in pond w[PREVIEW]nicellular organi[PREVIEW]hat help [PREVIEW]its basi[PREVIEW]it can su[PREVIEW]e. It ta[PREVIEW]from the pond[PREVIEW]digests it in organ[PREVIEW]lled food vacuoles. Nutrie[PREVIEW]oo[PREVIEW]the food then travel throu[PREVIEW]cytoplasm to the other organ[PREVIEW]which gives them energy so they[PREVIEW]function. This allows the cell to continue[PREVIEW]ng.

The outside of the cell has cilia, wh[PREVIEW]are like[PREVIEW]s tha[PREVIEW]er the paramecium cell. The cilia help move the cel[PREVIEW]lippin[PREVIEW]d forth in ponds to propel the organism through its surroundings.

Amoeba

An amoeba is a unicellular organism that we cannot see, but[PREVIEW]ive[PREVIEW]luding in soil, ponds, lakes, forests and rivers. They can usually be found in[PREVIEW]freshwater.

AMOEBA



Amoebas have a cell me[PREVIEW]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.

© Super Simple Sheets

Name: _____ 37

Curriculum Connection
B2.5

Unicellular Organisms

Questions

Use information from the text to support your answer

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

2) Fill in t[illegible] to explain how the cells meet their needs.

	[illegible]eba	Paramecium
Eat		
Move		

PREVIEW

Questioning

Write 2 questions you have [illegible] rea[illegible]

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

© Super Simple Sheets

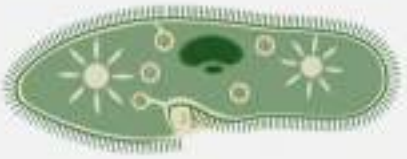
Name: _____ 38

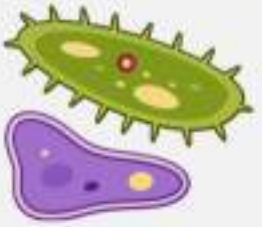
Curriculum Connection
B2.5

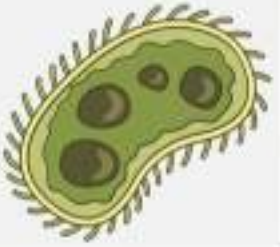
Research - Unicellular Organisms

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

- Euglena
- Chlamydomonas
- Chlorella
- Spirogyra







Rese[illegible] Answer the questions below

1) Which cell did you choose to research?

2) What organelles does it have?

3) List 3 important organelles from the cell and describe their function.

PREVIEW

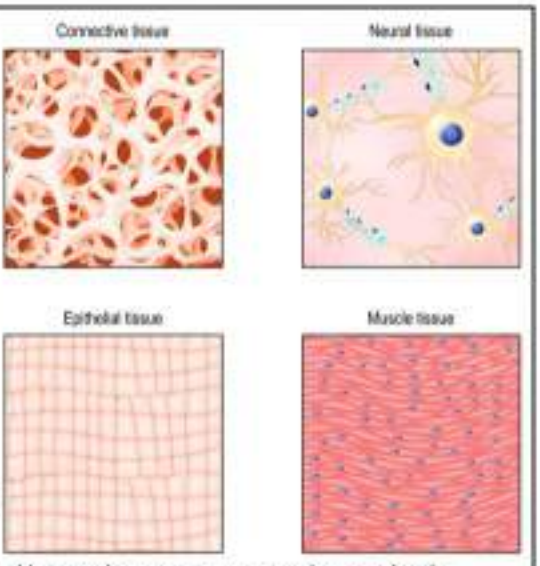
Name: _____ 40

Curriculum Connection
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 (skeletal tissue, nervous (brain) tissue, connective tissue and epithelial (skin) tissue. The structure and function of these different groups of cells are different. Structure is related to their function because cells need to have a certain shape to allow them to complete their task. For example, skin cells are flattened so they can protect the body from the environment. In addition, our muscle cells are thin 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 that do special jobs.

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

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.

© Super Simple Sheets

Name: _____ 41

Curriculum Connection
B2.5

Multicellular Organisms - Humans and Worms

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] eat and breathe?

Eat	
Breathe	

PREVIEW

True or False

Circle whether the statement is tru[illegible]als

1) A multicellular organism has one or more cells	[illegible]e	False
2) Humans and worms are unicellular organisms	True	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

© Super Simple Sheets

Name: _____ 42

Curriculum Connection
B2.5

Multicellular Organisms - Frogs

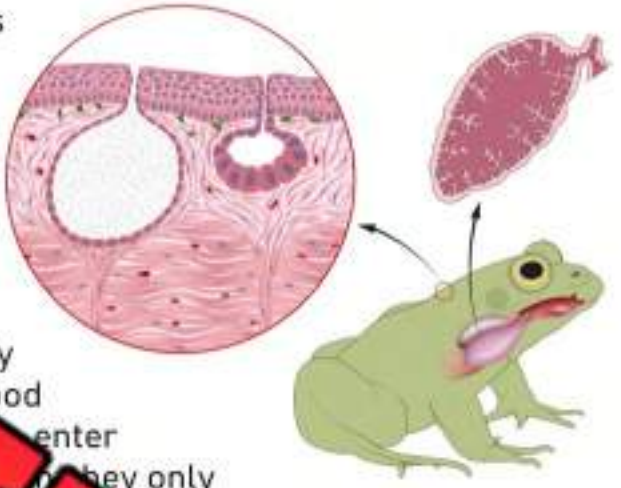
Frogs – Multicellular Organisms

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 basic needs for frogs is breathing. Frogs have a unique way of exchanging gas, as they can perform this in three different ways.

The Respiratory System of Frog



1) Lungs

The gas exchange is like humans, by using their lungs. Frogs can breathe in oxygen through their skin and into their lungs. The lungs look like balloons where they oxygenate blood through the skin and the blood is circulated throughout the body so that cells can enter the cells in the rest of the body. Unlike humans, they only breathe when necessary, not continuously.

2) Skin

Frogs can actually breathe through their skin. In fact, most breathing a frog does is through their skin. A frog's moist skin is thin and made up of blood vessels and capillaries that are close to the surface. The oxygen in the air and water surrounding the frog get diffused into the blood because the skin is so thin.

When frogs are in the water, this process works effortlessly. The water has oxygen available to it through the water. However, frogs can still breathe through their skin on land because they have glands in their skin that produces mucus, keeping them moist. If you've ever touched a frog, you've probably noticed they always 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

Name: _____ 43

Curriculum Connection
B2.5

Multicellular Organisms - Frogs



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 or false

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

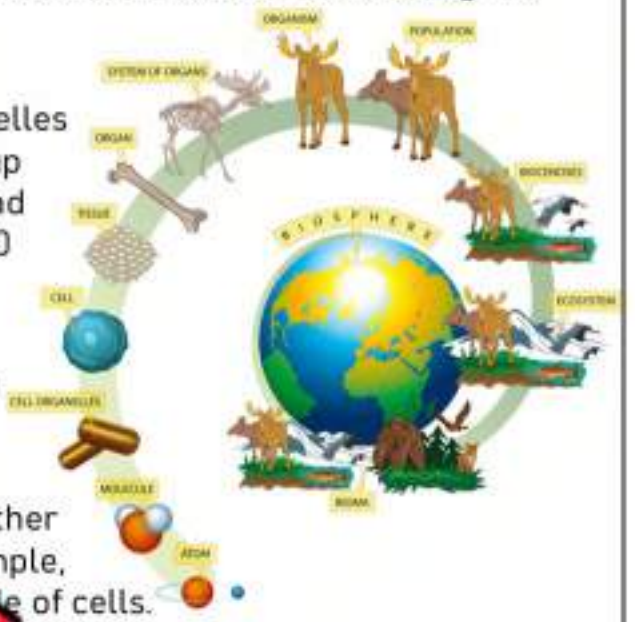
© Super Simple Sheets

Name: _____ 44

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 function to keep the cells alive. Cells are made up of molecules. In a typical human cell, there are around 42 million molecules. Even more, there are around 30 trillion cells in the human body.

2) Tissues
Tissues are groups of cells of the same origin that have the same function. Humans have four different types of tissues.

- Connective (Bone) Tissue – cells work together to bind the organs together. For example, tendons and ligaments are connective tissue made of cells.
- Epithelial (Skin) Tissue – sheets of cells that cover exterior surfaces of the body, line the interior cavities and passageways, and forms glands.
- Nervous (Brain) Tissue – found in the brain, spinal cord, and nerves. The cells are excitable, meaning they allow electrochemical signals to communicate to different regions of the body.
- Muscle Tissue – have cells that are also excitable, and respond to stimulation and contract to provide movement.

3) Organ
An **organ** is a structure made up of different tissues that work together to perform 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

Name: _____ 45

Curriculum Connection
B2.6

Levels of Organization - Cells, Tissues, Organs



Define What do the terms below mean? Provide examples.

	Definitions	Examples
Cell		
Tissue		
Organ		
Organ System		

PREVIEW

Question What is the relationship between cells, tissues, organs, 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

© Super Simple Sheets

Name: _____ 46

Curriculum Connection
B2.6

Levels of Organization - Cells, Tissues, Organs

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)



Tissue Organ Organ System

5)



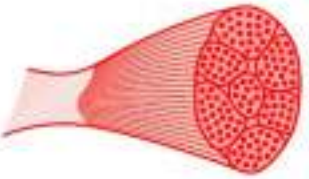
Cell Tissue Organ Organ System

6)



Cell Tissue Organ Organ System

7)



Cell Tissue Organ Organ System

8)



Cell Tissue Organ Organ System

PREVIEW

Name: _____ 47

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) Which o[illegible]em did you choose to research?

2) What is the fu[illegible]or[illegible]system?

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.

Name: _____ 50

Curriculum Connection
B1.1

Technologies - Electron Microscope

Microscopes

Without the use of microscopes, our sight is limited to seeing small things like dust particles, tiny hairs, and a grain of sand. But, if we had electron microscopes for eyes, we'd be able to see things 100 million times smaller! We could see bacteria, viruses, molecules, and even atoms clearly.



Ordinary optical microscopes use light and glass to magnify vision, but we often only see a magnificati[illegible]f up to 1000 times. Electron microscope[illegible]uch more powerful, allowing us to see [illegible]les things.

Electr[illegible]pe

Instead [illegible]ing lig[illegible] **microscopes** use a stream of electr[illegible]cts [illegible] the specimen that is being ex[illegible]en we [illegible]ht, we are using **photons** that [illegible] off t[illegible]so that we can see it.

The problem is t[illegible]ger than an electron. A photon is roughly 400-700 nanometres, whic[illegible]ary s[illegible] photons works well to see very small things, like human hair, which [illegible]00-[illegible]ometres in diameter.

An electron has a wavelengt[illegible] of o[illegible]e it is 400-700 times smaller than a photon. Bacteria has a size of 20[illegible]metres [illegible]d proteins are just 10 nanometres long. Using the electron micr[illegible]scope m[illegible]we c[illegible] these things in more detail, allowing us to understand their structure[illegible]ocess[illegible]

What We've Learned Using Electron Microscopes

Using the electron microscope has enabled scientists t[illegible]out th[illegible]tures and processes of organelles inside of cells. Cells can be seen u[illegible]egu[illegible]scope, but not all organelles are visible. Also, the organelles that can[illegible]se[illegible]ed in detail because their size is close to the limit of resolution of the ligh[illegible]

The electron microscope has allowed scientists to learn the comple[illegible]elicate structures of organelles. In addition, these microscopes can view viruses, b[illegible]teria, and even atoms! Atoms are the smallest unit of matter.

Electron microscopes are helping the health care system. Viruses are studied so scientists and health professionals can learn more about them. Moreover, diagnosing cancerous tumors cells can be done using electron microscopes. Having the ability to see our cells close-up gives doctors options to treat patients and keep them healthy.

Disadvantages of Electron Microscopes

There are disadvantages to electron microscopes. First, we cannot view living things, as the specimen needs to be put into a vacuum to be seen and this kills the living specimen. Secondly, we can only see black and white. Third, they are very expensive, so not all hospitals have access to them, causing inequality in healthcare. Lastly, they are large and bulky, so they require a lot of space.

PREVIEW

Name: _____ 51

Curriculum Connection
B1.1

Technologies - Electron Microscope



Questions

Use information from the text to support your answer

1) How are electron microscopes different from optical microscopes?

2) Ho[illegible] scopes helped humanity?

3) What are the disadvantages of ele[illegible] micros

PREVIEW

True or False

Circle whether the statement is true or false

1) Electron microscopes use a beam of photons	True	False
2) A photon is larger than an electron	True	False
3) Electrons are smaller than bacteria, viruses, and proteins	True	False
4) Photons are smaller than bacteria, viruses, and proteins	True	False
5) We can use an optical microscope to see viruses	True	False
6) Electron microscopes have saved lives	True	False
7) Electron microscopes allow us to see living things close-up	True	False

© Super Simple Sheets

Name: _____ 52

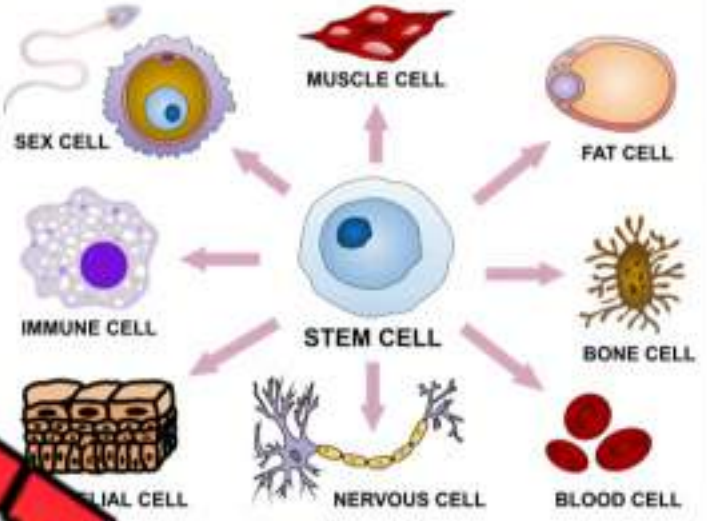
Curriculum Connection
B1.2

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: embryonic stem cells and adult stem cells.



Embryonic Stem Cells

Scientist[s] [ob]tain stem cells from embr[yos] [in] mammals. An embryo [is] unbo[rn] embryonic stem cells are taken [from] [an] embryo that is [5] days old and has only 150 [cells]. These st[em] cells will be able to be used to [form] any body.

Adult Stem Cells

Scientist can get adult stem cells much [easier] [from] bo[dy] tissues that are constantly forming new cells to replace old ones. [These] tissues [have] a small number of stem cells. When scientists take these stem cells, it is believed [that] they [can] only be used to form the organ that it is taken from.

Stem Cells Treating Disease

When someone has a disease, like Alzheimer's disease, [the] tissu[e] [in] their brain that is damaged. To treat Alzheimer's, stem cells can be taken so [they] can [grow] new brain tissue in a laboratory. Once the brain tissue has mature cells, it [can] replace the damaged tissue in the brain.

In 2016, Kristopher Boesen was in a car accident that left him paral[yzed] 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

Name: _____ 53

Curriculum Connection
B1.2

Stem Cell Technologies Treating Disease

Questions

Use information from the text to support your answer



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

2) Ho[illegible] stem c[illegible]ed in healthcare?

PREVIEW

Questioning

Write 2 ques[illegible]s you h[illegible]bo[illegible]e reading

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

© Super Simple Sheets

Name: _____ 56

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 raising, let's say – a cow, from birth for the meat, dairy and leather, you take cells and t[illegible]hose cells to produce the same products. One of the products that can be made throu[illegible]agriculture is meat. The way that works is you take a biopsy, a small injection f[illegible]l, say a cow, and from that biopsy there are cells in that called stem cells, [illegible]at have the ability to divide into more cells, as well as specia[illegible]and dif[illegible]g – becoming different types of cells, like muscle cells and fat cells and other tw[illegible]you find in meat products. Those stem cells are then put into a nutrient form[illegible]d the[illegible]lture media and, at scale – the stems cells and the cell culture media[illegible]ced i[illegible] large bio-reactor, and [illegible]ou[illegible] that would be a cell-cultu[illegible]a[illegible] product or what I call cell-ba[illegible]."



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

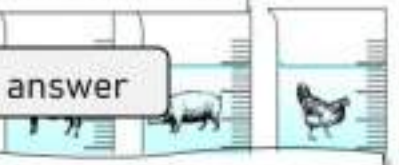
- We will not need to kill animals for human consumption
- It is more sustainable, as livestock farming contributes massive amounts of greenhouse gases that are causing global warming
- Farms take up a lot more space than laboratories. It is estimated that the same amount of meat could be made in laboratories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

PREVIEW

Name: _____ 57

Curriculum Connection
B1.2

Cellular Agriculture - Cultured Meats



Questions

Use information from the text to support your answer

1) What is cellular agriculture and cultured meat?

2) Ho[illegible]ed [illegible]de?

PREVIEW

Explain

What are the advant[illegible]s and di[illegible]ant[illegible]s of cultured meats?

Advantages	[illegible]s

Name: _____ 58

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.	
[illegible]s (Pigs, Cows a[illegible] Chickens)	
Livestock Farmers	
Environmentalist (People who care a lot about the environment)	
Average Person in Canada	

PREVIEW







STEM INVESTIGATION AND COMMUNITICATION SKILLS

Cek

PREVIEW





© Super Simple Sheets

Grade 8 Science Unit

Strand A - STEM Investigation and Communication Skills

	Curriculum Expectations	Pages That Cover the Expectations
A1.1	use a scientific research process and associated skills to conduct investigations	66 – 67, 77, 79
A1.2	use a scientific experimentation process and associated skills to conduct investigations	68 – 73
A1.3	use an engineering design process and associated skills to build and test devices, models, structures, and/or systems	66 – 67
A1.4	follow health and safety procedures during science investigations, including wearing appropriate protective gear and clothing and safely using tools, instruments and materials	66 – 73
A1.5	communicate their findings using science and technology vocabulary and formats that are appropriate for specific audiences and purposes	66 – 73
A2.1	write and execute code in investigations when modelling concepts, with a focus on automated systems in action	76, 81 – 82
A2.2	identify and describe impacts of coding and of emerging technologies, such as artificial intelligence systems, on everyday life, including skilled trades	
A3.1	describe practical applications of science and technology concepts in various occupations, including skilled trades, and how these applications address real-world problems	74 – 76, 78
A3.2	investigate how science and technology can be used with other subject areas to address real-world problems	74 – 80
A3.3	analyse contributions to science and technology from various communities	74 – 75

PREVIEW

© Super Simple Sheets

Name: _____ 66

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.

Material — Ideas you could use for your model

- ❑ Base: styrofoam, shoe box, clay or playdough, ice cream tray, brownie
- ❑ Organelles: pipe cleaners, playdough, felt, candy
- ❑ Labels: small pieces of paper and toothpicks



PREVIEW

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

Name: _____ 67

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

Activity - Plant and Animal Cell Model

Questions Answer the questions below

1) Which type of cell did you choose?

2) Which [illegible]lles did you include in your model?

3) Where did you put the nucleus?

4) Describe the vacuole you included.

5) Which organelles did you include that are not in the other type of [illegible]? 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?

PREVIEW

Name: _____ 68

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 concentration.

PREVIEW

Materia — you will need for the experiment

- ❑ Two clear
- ❑ Hot and col — f you — water or near boiling wate — om the tap, the experiment — k
- ❑ Food colouring – two colours wor — t. You could use red for the hot wate — nd blue for cold but the colours aren't important



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



Name: _____ 69

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

Diffusion - Hot and Cold Water

Results	Answer the questions below

1) What is diffusion?

2) Which t ater did the food colouring diffuse in faster?

3) Wh u thin colouring diffused faster in the hot water?

4) What happened when the diff n pr

5) How could you have sped up the diffusion process s?

6) Which liquid is more concentrated – the water or the food colouring? E n.

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: _____ 70

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 principle.

Materials — What you will need for the experiment

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





Procedure — How you will complete the experiment

1) Fill both glasses with water
2) In one of the glasses, add 2-3 tablespoons of salt and stir 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?

PREVIEW

© Super Simple Sheets

Name: _____ 71

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

Experiment - Osmosis

Hypothesis

What do you think will happen?

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

Water	Saltwater

Observations

ened?

Describe what happened to in b 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?

© Super Simple Sheets

Name: _____ 72

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.

Material
What you will need for the experiment

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



Procedure
How you will 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!

PREVIEW

Name: _____ 74

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 the cell sample in airtight refrigerators
- Examining the cell under a microscope



BIOTECHNOLOGY

Many of these processes are time sensitive, meaning the scientist must be present throughout the entire process. For example, after collecting the sample it must sit for 12 hours before preparing for storage. After which it may need to be stored 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 steps in 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 and track how 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

Name: _____ 75

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

Coding - Cell Sample Automation

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) Machine[illegible] do work more efficiently with less mistakes	True	False
5) Machin[illegible]ore mistakes than humans	True	False

Que[illegible] A[illegible]e questions below using evidence from the text

1) How is tech[illegible]ng in[illegible]iology and the study of cells?

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

PREVIEW

Directions Finish the If/Else statements below for a cell sample aut[illegible]tion 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]

© Super Simple Sheets

Name: _____ 76

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 frid rea for storage containers, needle for taking samples, and microscope to examine t ample.

Yo d to set times between the tasks. How long should the machine wait b g mple to the next stage?

PREVIEW

Defined Counts me veen each task below. Fill in the if/then statements

Counts

set time1 between a to fridge to

set time2 between cell refri n a lysis 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

Name: _____ 77

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

STEM Assignment - Creating a Machine

Questions	Answer questions about your machine

1) How will your machine help biologists?

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

3) What is a defined count? Explain how it is use[illegible]re d[illegible] computer to use later.

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

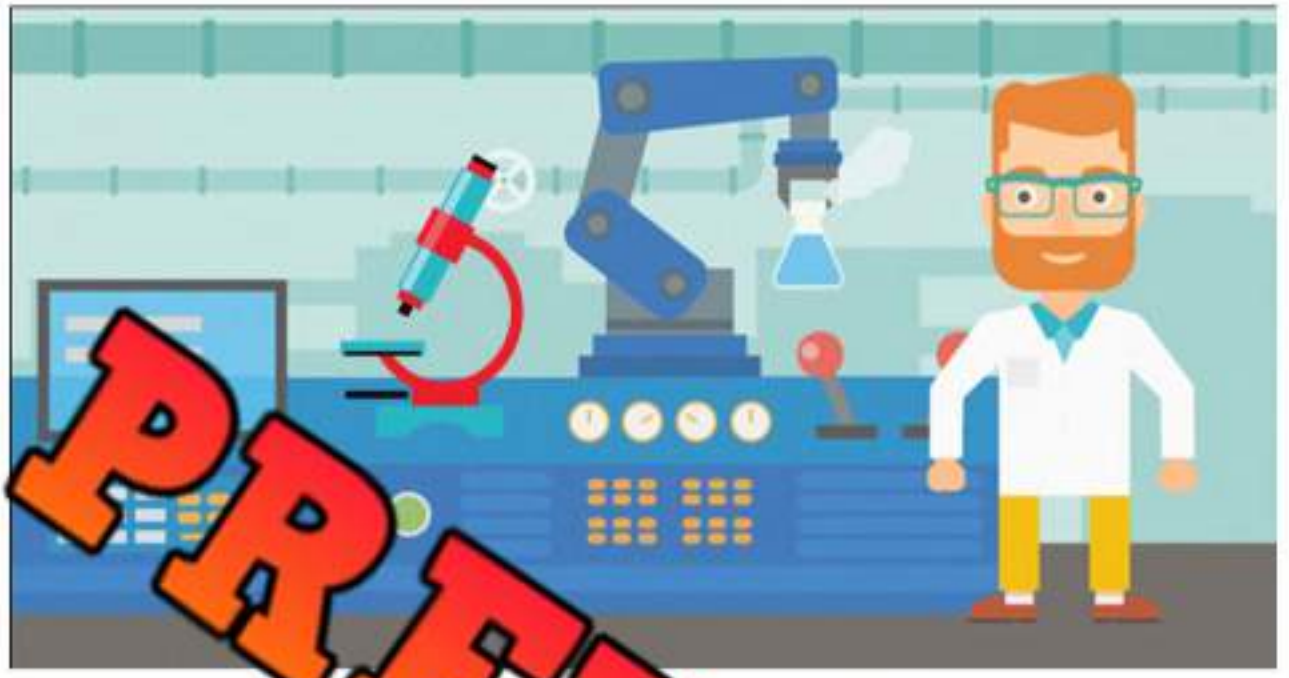
PREVIEW

© Super Simple Sheets

Name: _____ 80

Curriculum Connection
A3.2

Programming a Robot Lab Assistant



PREVIEW

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

1) What do the buttons do on Dr. Natha[illegible]ot assi[illegible]Write at 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 re[illegible]utton is pressed, then robotic arm dumps a sample from beaker under microscope.	
Button 1	
Button 2	
Button 3	

© Super Simple Sheets

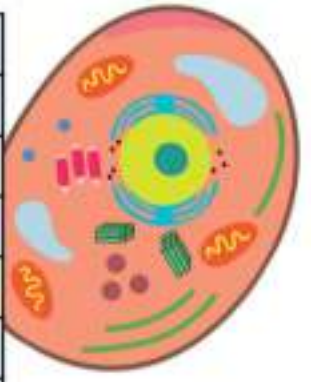
Name: _____ 81

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)
  - D cuole – misshaped circle
  - gi aparatus
  - 4 time
  - Dra ion (peanut shape)
- Repeat
  - Draw itric
- Draw a smooth endo retic







PREVIEW

© Super Simple Sheets

Google Slides Lessons Preview

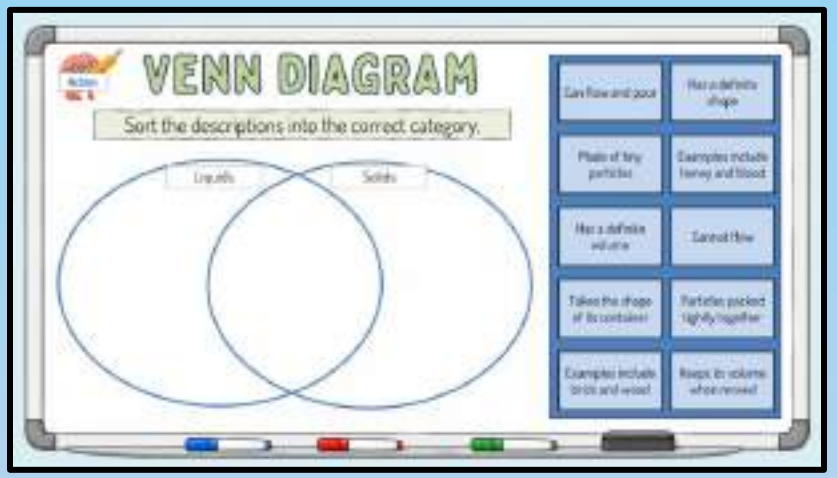
© Super Simple Sheets

Ontario Science Curriculum
Fluids – Grade 8

3-Part Lesson Format

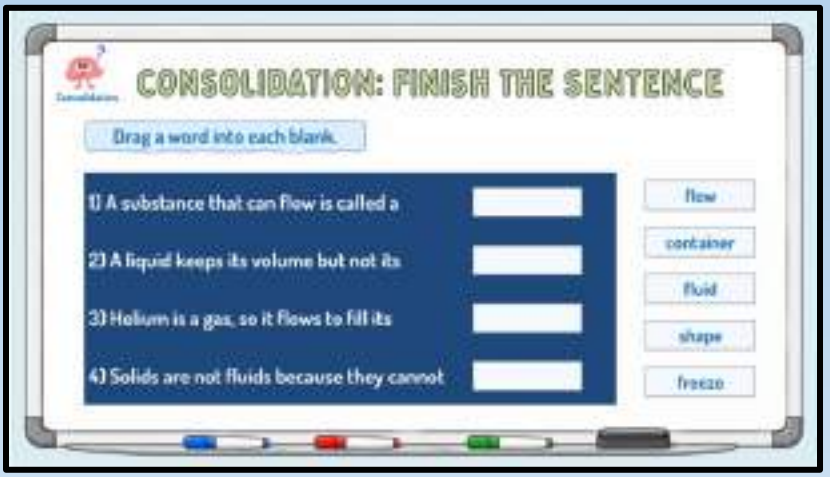
Part 1 – Minds On!
- Learning Goals
- Discussion Questions
- Quotes
- And More!



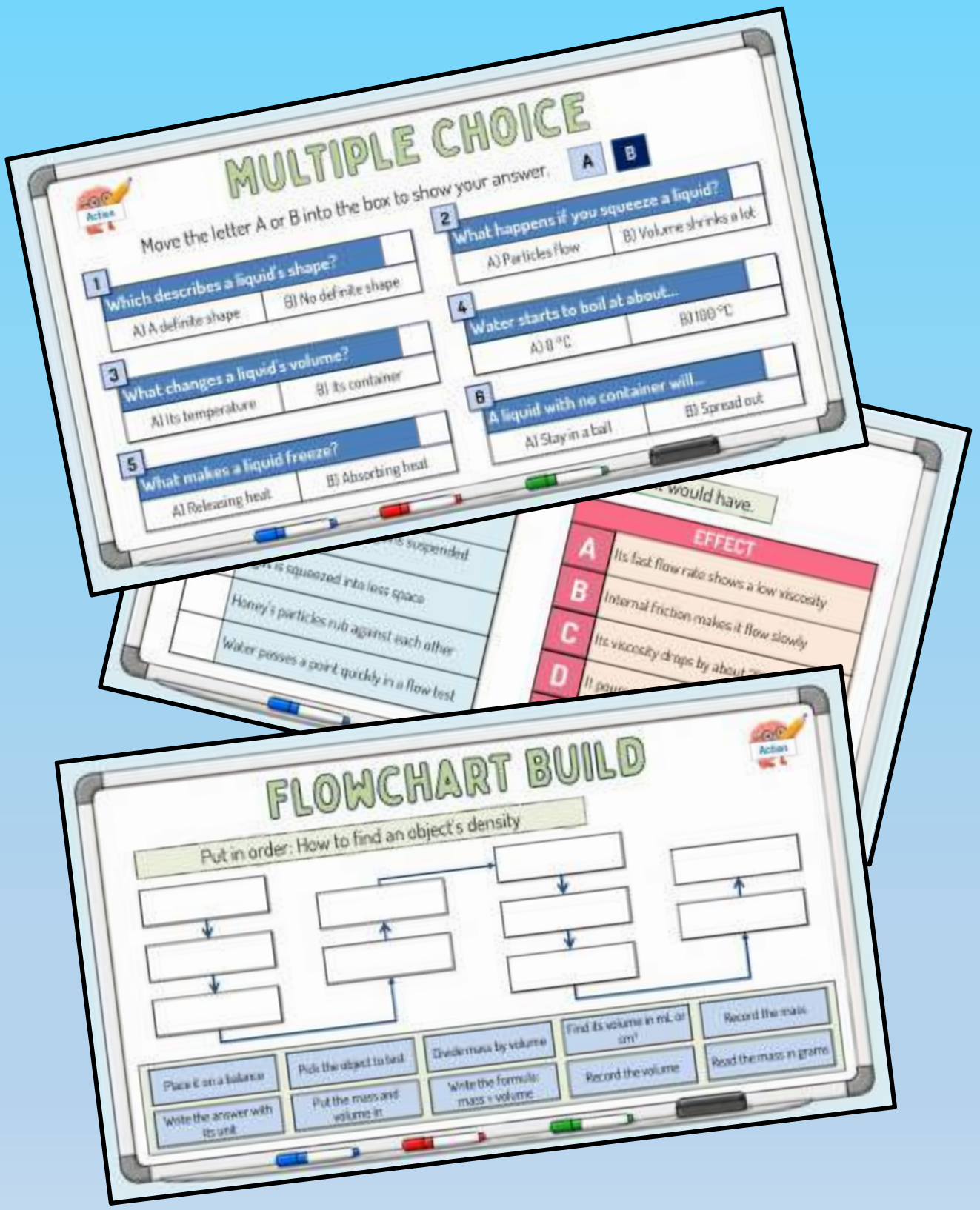


Part 2 – Action!
- Writing
- Matching
- Drag and Drop
- Drawing
- And More!

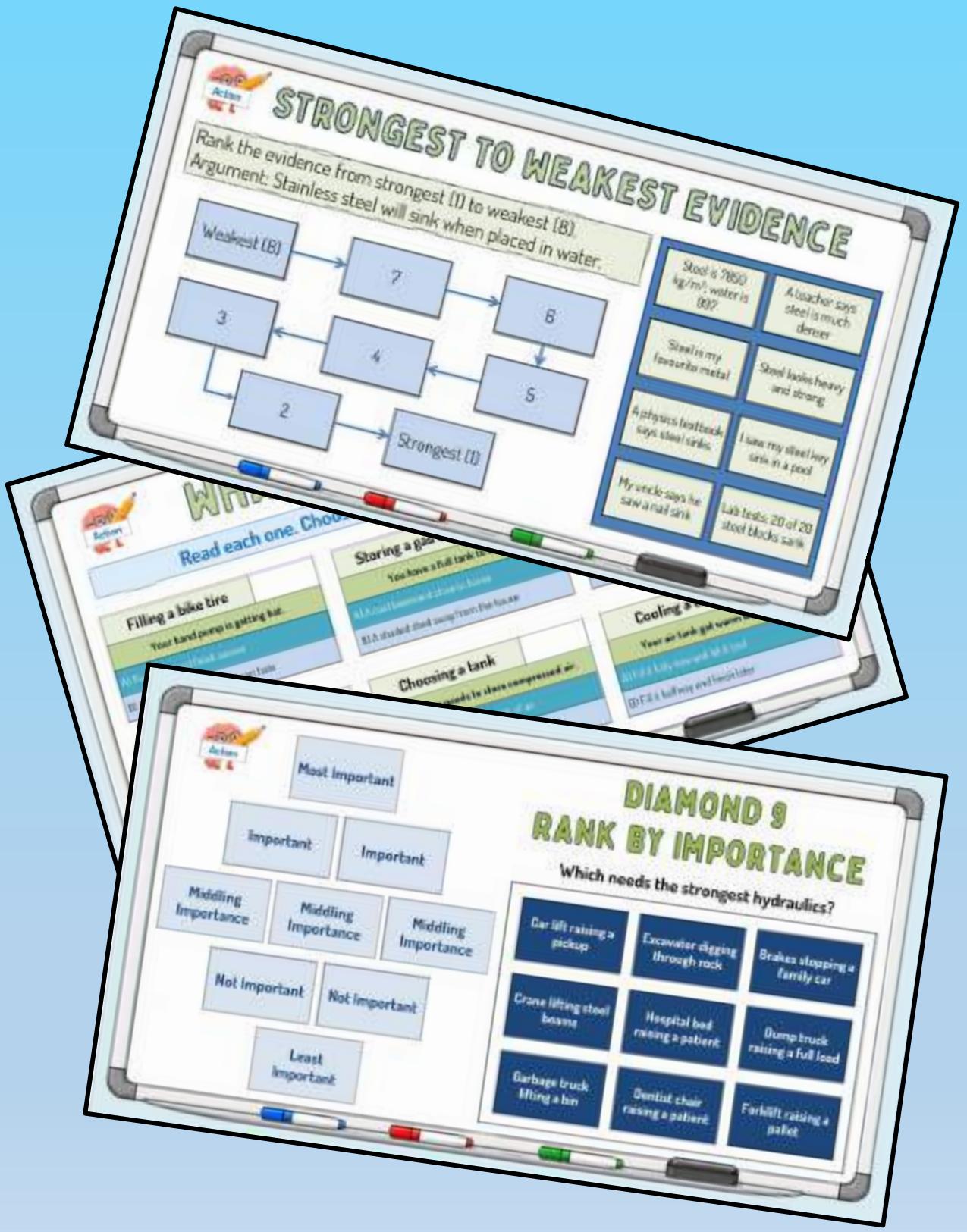
Part 3 – Consolidation!
- Exit Cards
- Quizzes
- Reflection
- And More!



Ontario Science Curriculum
Fluids – Grade 8



Ontario Science Curriculum
Fluids – Grade 8



Workbook Preview

© Super Simple Sheets

Grade 8 Science Unit

Fluids

C1 - Relating Science and Technology to Our Changing World
C2 - Exploring and Understanding Concepts

	Curriculum Expectations	Pages
C1.1	assess the environmental, social, and economic impacts of various innovations and technologies that are based on the properties of fluids	66-68, 75-80, 92-93
C1.2	assess the environmental and social impacts of fluid spills, including impacts on First Nations, Métis, and Inuit communities, and including the cost and technical challenges related to cleanup and remediation efforts	94-100
C2.1	demonstrate an understanding of the factors that affect	9-13, 21-22, 51
C2.2		, 34, 80
C2.3		22
C2.4	their compressibility and how their compressibility affects their technological applications	64-66, 71-80
C2.5	determine the buoyancy of an object, given its density, in a variety of fluids	35-37, 40-41, 46-47
C2.6	explain in qualitative terms the relationship between pressure, volume, and temperature when a liquid or a gas is compressed or heated	53-57, 62-63
C2.7	describe how forces are transferred in all directions in fluids, including using Pascal's law to quantify the transfer of forces in fluids	23, 64-68
C2.8	describe factors that affect the flow of fluids	81-82
C2.9	describe the differences between pneumatic and hydraulic systems	48-51, 64-65, 71-80
C2.10	compare how fluids are used and how their flow is regulated in living organisms and in mechanical devices or systems	83-91

Preview of 80 pages from this product that contains 169 pages total.

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	103-106
A1.2	use a scientific experimentation process and associated skills to conduct investigations	14-15, 30-33, 38-39, 42-45
A1.3	use the engineering design process and associated skills to build and test devices, models, structures, and/or systems	58-61
A1.4	follow safety procedures during science and technology investigations, including wearing appropriate protective clothing and safely using tools, instruments and materials	14-15, 30-33, 38-39, 42-45, 58-61
A1.5	communicate their findings using science and technology vocabulary and formats that are appropriate for specific audiences and purposes	14-15, 30-33, 38-39, 42-45, 58-61
A2.1	write and execute code in investigations that involve computational thinking and modelling concepts, with a focus on automated systems in action	70, 101-102, 104
A2.2	identify and describe impacts of coding and of emerging technologies, such as artificial intelligence systems, on everyday life, including skilled trades	1-102, 104
A3.1	describe practical applications of science and technology concepts in various occupations, including skilled trades, and how these applications address real-world problems	69-70, 102-103, 105
A3.2	investigate how science and technology can be used with other subject areas to address real-world problems	69-70, 102-103, 105-106
A3.3	analyse contributions to science and technology from various communities	69-70, 102-103, 105

PREVIEW

© Super Simple Sheets

NAME: _____

FLUIDS



PREVIEW

© Super Simple Sheets

supersimplesheets.com

Name: _____ 8

Key Terms

Define Research the meaning of each of the key terms.

Fluid	
Viscosity	
Hydraulics	
Buoyancy	
Valve	
Density	
States of Matter	

PREVIEW

© Super Simple Sheets

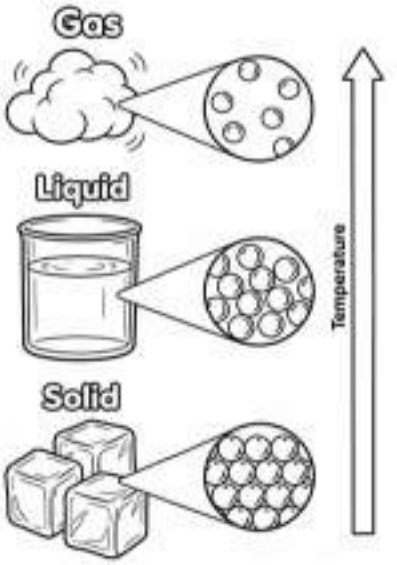
Name: _____ 9

Curriculum Connection
C2.1

What is a Fluid?

What is a Fluid?

A **fluid** is a substance that is either a liquid or a gas that can flow. Fluids take the shape of their container because they flow and spread out easily. Water, a liquid is a fluid because it flows and takes the shape of its container, often a cup or bottle to drink from. Helium is a gas that is also a fluid, as it flows to fill its container. A helium tank will have helium gas inside that spreads throughout the container. If we open the valve to the tank, the helium gas will flow to fill the container, or space it is in.



Solids are fluids because solids cannot flow. Solids have a definite shape and a definite volume because the particles that make up a solid are packed closely together. This means that if a solid is moved, its closely packed particles will keep its volume and the shape.

A liquid has a definite volume but does not have a definite shape. This means that 200mL of water in a cup will have the same volume if you pour that water into a new cup even though the shape of the water will be different if the shape of the cup is different.

PREVIEW

Fluid or Not?

Circle yes if the substance is a fluid and no if it isn't.

1) Honey	Yes	No
2) Blood	Yes	No
3) Toothpaste	Yes	No
4) Cement	Yes	No
5) One grain of sand	Yes	No

6) Glass	Yes	No
7) Paint	Yes	No
8) Ketchup	Yes	No
9) Brick	Yes	No
10) Wood	Yes	No

Examples

Write your own examples of fluids and non-fluids.

Fluids	Non-Fluids

© Super Simple Sheets

Name: _____ 10

Curriculum Connection
C2.1

Understanding Viscosity

What is Viscosity?

Viscosity is a measure of a fluid's resistance to flow. A fluid with a high viscosity will resist flow more than a fluid with a low viscosity. For example, honey is more viscous than water as it pours slower than water does.

A more complete definition of viscosity includes a fluid's internal friction. In a highly viscous fluid, the properties of the fluid create more internal friction, which means the fluid does not flow as well. Inside honey, the particles create more friction as they rub against each other, causing the honey to flow slowly.

Examples of fluids with high viscosities are molasses, olive oil, peanut butter, and maple syrup. Examples of fluids with low viscosities are air, water, gasoline, and milk.



Factors Affecting Viscosity

There are four factors that affect the viscosity of fluids. Each of the fluids mentioned earlier are affected by these factors, changing their viscosity.

1) **Temperature** – The viscosity of liquids decreases by about 2% for each degree rise in temperature. This means the higher the temperature of a liquid, the less viscous it is. For example, hot olive oil is thinner and is much less viscous than cold olive oil. For gases, it is the opposite. If we heat a gas, it will become more viscous.

2) **Pressure** – If we increase the pressure of a fluid, we increase the viscosity. Liquids cannot be compressed, but gases can. When we compress gases, increased pressure increases the viscosity of the gas.

3) **Suspended Particles** – A fluid with suspended particles in it will have a higher viscosity. For example, spoiled milk has a higher viscosity than fresh milk as it has suspended particles in it.

4) **Chemical Composition** – The chemical makeup of a fluid will affect its viscosity. Fluids with large molecules flow faster, meaning they are less viscous than fluids with small molecules.

Measuring Viscosity

We can measure the viscosity of a fluid by determining its volumetric flow rate. The **volumetric flow rate** is the volume of a fluid passing a point in a system per unit time. In other words, we are measuring the movement of a fluid through a device over time. A fluid with a fast flow rate will have a low viscosity.

PREVIEW

Name: _____ 11

Curriculum Connection
C2.1

Questions Answer the questions below using evidence from the text.

1) What is viscosity? Name two high viscous and two low viscous fluids.

2) What a viscosity of fluids?

Making Connections Have you e d a l noticed it becomes less viscous? Explain.

PREVIEW

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

1) As the temperature of a gas increases, its viscosity decreases.	True	False
2) A highly viscous fluid will flow faster than a low viscous fluid.	True	False
3) There is more internal friction in low viscous fluids.	True	False
4) We measure viscosity by determining the flow rate of a fluid.	True	False
5) Molasses has a low viscosity.	True	False

© Super Simple Sheets

Name: _____ 13

Curriculum Connection
C2.1

Viscosities of Various Fluids

The standard unit of viscosity is the pascal-second (Pa·s). The only problem with using this unit of measurement is that one pascal-second is better for measuring high viscous fluids, like honey and not as good as measuring low viscous fluids, like water. For example, honey has a Pa·s of 2-10 while water has a Pa·s of 0.000894 or 8.94×10^{-4}.

For numbers that are easier to work with, we can use mPa·s, which are millipascal-seconds. Honey has a viscosity of 2000-10000 mPa·s and water has a viscosity of 0.894 mPa·s.



When measurements for these fluids are taken, the temperature is also noted because the temperature has a direct impact on the viscosity. There is a difference in viscosity between honey that is boiling versus honey that is frozen. In most cases, the measurement for viscosity is taken at room temperature (about 20 °C).

PREVIEW

Research Find the viscosities of the fluids below by researching them online.

	Fluid	mPa·s	Describe the Viscosity (Low, Average, High)
1)	Air		
2)	Olive Oil		
3)	Corn Syrup		
4)	Molten Glass		
5)	Mercury		
6)	Yogurt		
7)	Shortening		
8)	Toothpaste		
9)	Worcester Sauce		
10)	Engine Oil		
11)			
12)			

© Super Simple Sheets

Name: _____ 14

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

Experiment – Comparing Viscosities

Hypothesis Rank the fluids in order from highest viscosity to lowest viscosity.

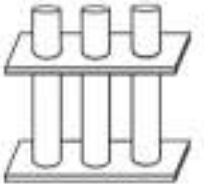
Water	Honey	Molasses	Milk	Oil	Dish Soap

1)	2)	3)
4)	5)	6)

PREVIEW

Materials ill yo the experiment?

- ❑ Stopwatch
- ❑ Graduated cylinder (the tall[illegible], th
- ❑ Marble – about half the size of the iamete[illegible]
- ❑ Enough fluid to fill the cylinder for each [illegible] r, honey, molasses, milk, oil, dish soap. You can substitu[illegible]ids. So[illegible]out the fluids from the hypothesis and write in the fluids [illegible]



Procedure How will you complete the experiment?

1) Fill the cylinder with the first fluid you will measure.
2) Have a stopwatch ready, especially with the fluids that have a low viscosity.
3) Drop the marble into the cylinder and start the stopwatch.
4) Write down how long it took for the marble to fall to the bottom.
5) Repeat with another fluid until you have measurements for each fluid. You could share fluids to minimize waste.
6) Answer the questions on the next page.

© Super Simple Sheets

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

Observations What did you notice as you completed the experiment?

Fluid	Time To Fall

Results [illegible] below.

1) Was your hypothesis [illegible] surprise you? Explain.

2) Viscosity measures a fluid's resistance to flow. [illegible] help explain the viscosity of these fluids?

3) Rank the fluids in order from which the marble fell the fastest to slowest.

1)	2)	3)
4)	5)	6)

4) How could you have decreased the viscosity of these fluids?

PREVIEW

© Super Simple Sheets

Name: _____ 16

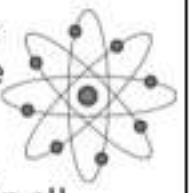
Curriculum Connection
C2.3

Particle Theory

Particle Theory
The **particle theory** states that all matter is made up of tiny particles that are constantly moving. The speed the particles move depends on which state of matter they are in.

Solids
Particles in solids are held tightly together. They are strongly attracted to each other, meaning they move slowly. These particles vibrate instead of move, but they are not still.

Liquids
Particles in liquids are fairly close together with some attraction between them. They move in all directions, but they can't move too far because they are attracted to near them.



Gases
Particles in gases have very little attraction between them. They move rapidly in all directions. They collide with each other and the walls of the container they are in.

PREVIEW

Fill in the Blanks

Complete the sentences using words from the word bank.

Small	Particles	[illegible]	Moving	Matter
Gas	Solid	Liquid	[illegible]	Weakest

All things we can touch are made up of _____ particles _____ compounds that make up _____. The particle theory states that all particles are _____ constantly. They move faster based on which _____ matter they are in. Particles in _____ have the strongest attraction, particles in _____ have the _____. Particles in _____ are fairly close together. The _____ the attraction, the less the particles will move, like in solids.

Draw

Add particles (dots) to the beakers to represent which state of matter it is.



Gas **Liquid** **Solid**

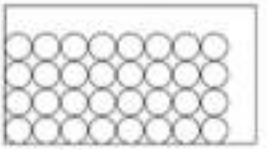
Name: _____ 17

Curriculum Connection
C2.3

All About Solids

All About Solids

A **solid** is one of the states of matter. In a solid, the particles are very closely packed together because they are attracted to each other. The forces between the particles are strong so that the particles cannot move freely. Instead of moving, the particles stay in place and vibrate. As a result, a solid:



- has a definite shape (do not take the shape of their container)
- holds that shape unless an outside force acts upon it (example – cuts it)
- is difficult to compress as the particles are already packed tightly
- [illegible] because there are many particles packed closely together

Transform

Solids c[illegible]d into the other states of matter. When a solid is melted, it becomes a liqu[illegible]ple[illegible]g ice cube transforms from solid ice to liquid water. A solid can also [illegible]nsform[illegible]o a gas through a process called sublimination. This process happens rarely [illegible]me[illegible]t it can be observed when dry ice turns directly into a gas (carbon dio[illegible]

PREVIEW

Questions Use inform[illegible]the te[illegible]pport your answer.

1) What do you think it means fo[illegible]olid [illegible]shape? (hint: a gas/liquid does not have a definite shape).

2) How can solids be transformed into other states of matter? [illegible]an

Visualizing What were you picturing while you were reading? Draw it!

© Super Simple Sheets

Name: _____ 18

Curriculum Connection
C2.3

All About Liquids

All About Liquids

A **liquid** is one of the states of matter. The forces between the particles cause them to be fairly close together, but they do move around slightly in all directions. As a result, liquids:

- do not have a definite shape
- fill the bottom of a container or spread when they are not contained
- maintain the same volume unless the temperature of the liquid changes
- are difficult to compress because the particles can move and flow when compressed



Transform ids

Liquids ca transformed to a solid or a gas. This happens if the liquid heat energy. If we release heat from a liquid by putting it in a freez solid. This happens when a liquid reaches its freezing point, which is erent f liquids.

A liquid ng where it will become a gas. For example, water begins to boil at 100° C , if a l bs enough heat, it could reach its boiling point and become a gas.

PREVIEW

Questions

Use information e te your answer.

1) Why do you think liquids flow and fill ttom of Explain.

2) How can liquids be transformed into other states of matter? Give an

Making Connections

When have you seen a liquid change states? Explain.

© Super Simple Sheets

Name: _____ 20

Curriculum Connection
C2.3

All About Gases

All About Gases

Matter can take the form of a gas. The spaces between gas particles are very big, which allows the particles space to move around quickly. This is because the particles have very little attraction between them. The particles are free to move in all directions. As a result, gases:



- do not have a definite shape
- take the volume and shape of their container or spread when not contained
- [illegible]sily compressed because there are less particles in the space they are in
- [illegible] low density because there are not many particles in a large space

Transfor[illegible]

A gas [illegible]rm into a liquid through the process of condensation. Conde[illegible]n occu[illegible] in our environment when water vapour fogs up our glasses or when vapour for[illegible]n the glass of a cold drink.

A gas ca[illegible]rm [illegible]into a solid through the process of deposition. An example of this is [illegible]ost ha[illegible] water vapour from humid air turns directly to ice.

PREVIEW

Questions Use information [illegible]tex[illegible]t your answer.

1) Why will a gas take the shape of its c[illegible]r or s[illegible]n not contained?

2) Why can gases be compressed? Have you ever heard of co[illegible]ress

Questioning Write 3 questions that you are wondering about gases.

1)	
2)	
3)	

© Super Simple Sheets

Name: _____ 23

Curriculum Connection
C2.2, C2.7

Quiz Check-In	This quiz will assess students' understanding of the concepts covered in the Fact or Fiction activity.

Name: _____

Mark

Is the statement true (T) or false (F)?

1) Solids can be poured into containers just like liquids.	T	F
2) Gases are easily compressed because there is space between particles.	T	F
3) Carbon dioxide gas is used to make soda fizzy.	T	F
4) Liquids always keep the same shape no matter the container.	T	F
5) Heating a solid can make it melt and become a liquid.	T	F

Name: _____

Mark

Is the statement true (T) or false (F)?

1) Solids can be poured into containers just like liquids.	T	F
2) Gases are easily compressed because there is space between particles.	T	F
3) Carbon dioxide gas is used to make soda fizzy.	T	F
4) Liquids always keep the same shape no matter the container.	T	F
5) Heating a solid can make it melt and become a liquid.	T	F

PREVIEW

Name: _____

Mark

Is the statement true (T) or false (F)?

1) Solids can be poured into containers just like liquids.	T	F
2) Gases are easily compressed because there is space between particles.	T	F
3) Carbon dioxide gas is used to make soda fizzy.	T	F
4) Liquids always keep the same shape no matter the container.	T	F
5) Heating a solid can make it melt and become a liquid.	T	F

© Super Simple Sheets

Name: _____ 24

Curriculum Connection
C2.2

Relationship Between Mass, Volume, and Density

What is Mass?

Mass is a measurement of the amount of matter in an object. Mass is measured in grams (g). There are three states of matter – solid, liquid, and gas.

Mass and weight are similar measurements that are most often the same. Weight is a measure of how the force of gravity acts upon the mass of an object. Therefore, weight and mass will be the same on Earth unless you are weighing yourself far from the Earth's surface, like at the top of Mount Everest.

What is V

Volu ...of the amount of space and object takes up. Volume is meas... milli... or centimetres cubed (cm^3).

What is Densi

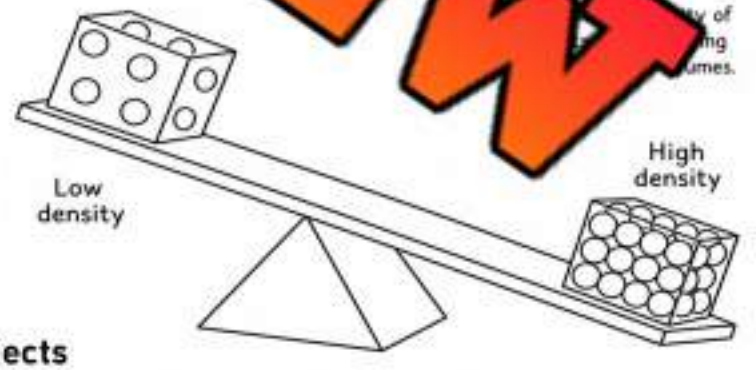
Density is a mea... how t... ...ed and how heavy the molecules are in an object. Therefore, de... is ... ...atter within a certain volume. We can measure density using ki... ...r cub... (kg/m^3) or gram per centimetre cubed.

Relationship Between Mass, Vo... e, a...

To understand the density of an object ... its ... ...nd volume. When we know the mass and volume, we use the follo... equati... de...

Density = $\frac{mass}{volume}$ or p = $\frac{m}{v}$ where p equals densi... qual... equals volume.

If an object has a small mass but a large volume, it will have a low density. On the contrary, if the object has a large mass but a small volume, the mass is packed in tightly, meaning the object has a high density. This would tell us that the object's matter is very compact within it.



Examples of High- and Low-Density Objects

High Density Objects	Low Density Objects
Steel	Sponge
Brick	Basketball
Hard Rubber	Cork

PREVIEW

Name: _____ 25

Curriculum Connection
C2.2

Questions Use information from the text to support your answer.

1) Define the terms below.	
Mass	
Volume	
Densi	

2) W[illegible]tween mass, volume, and density?

PREVIEW

Draw Draw circles to add mass to the boxes[illegible]all h[illegible]e same volume.

Low Density	Medium Densi[illegible]	[illegible]ensity

Brainstorm Write 5 examples of high density objects and low density objects.

Low Density Objects	High Density Objects

© Super Simple Sheets

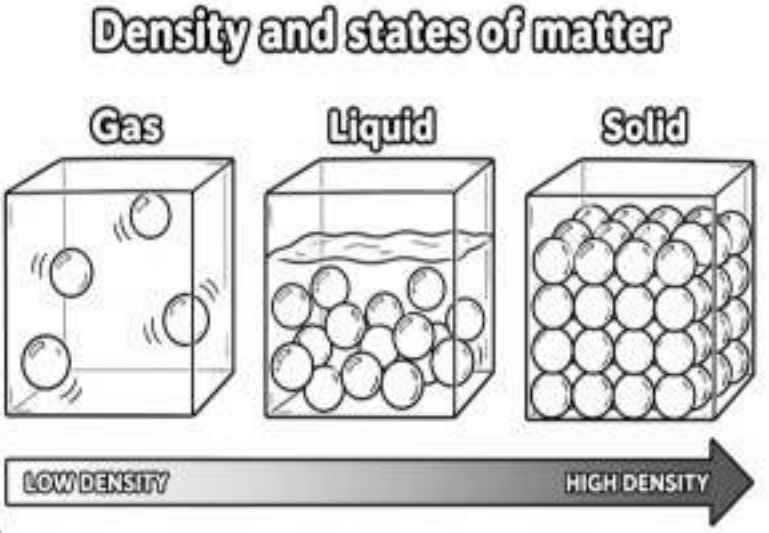
Name: _____ 26

Curriculum Connection
C2.2

Density of Gases, Liquids, and Solids

Densities and States of Matter

We can calculate the density of gases, liquids, and solids. The difference between the densities of solids, liquids, and gases has to do with the distance between the particles in each state.



PREVIEW

Gases

In a gas, the particles are moving rapidly. There is a lot of room to move their closest neighbors. This means gases have a relatively low density because there is not much mass in the space that is occupied.

All gases have low densities, much lower than liquids and solids, but there is a difference between the densities of gases. For example, fluoropentane is a gas used in fire extinguishers that has a higher density. On the other hand, methane gas has a density of 0.657 kg/m^3.



Liquids

The particles in a liquid move less as they have less volume to move around in. This means that compared to a gas, there are more particles packed into the space they occupy. Therefore, liquids have higher densities than gases.

Not all liquids have the same density. In fact, we can see this in action when we pour different liquids into a cup. For example, if you pour oil and water into a cup and let it settle for awhile, eventually you will observe two separate layers with the oil being on top of the water. This is because water has a higher density than oil. Since it has a larger mass and the same volume (container), it sinks below the oil. Water has a density of 997 kg/m^3, which means solids and liquids that have a density less than that will float to the top.

Solids

The particles in a solid are tightly compact. The density of solids varies depending on the solid. If a solid has less density than the liquid it is in, it will float. If it has a higher density than the liquid, it will sink.

For example, stainless steel has a density of 7850 kg/m^3, while the average piece of wood has a density of 780 kg/m^3. This means the steel will sink in water and the wood will float. Wood densities do vary as not all woods float in water.

© Super Simple Sheets

Name: _____ 27

Curriculum Connection
C2.2

Questions

Use information from the text to support your answer.

1) Describe the densities of each state of matter.	
Gas	
Liquid	
Soli	

2) Wh[illegible] spens w[illegible] and oil are poured into the same cup? Explain.

3) Why does stainless steel sink and m[illegible]ds flo[illegible]? Explain.

PREVIEW

True or False

Circle whether the statement is true or false.

1) Oil has a higher density than water.	True	False
2) Stainless steel has a higher density than water.	True	False
3) Gases have a much lower density than liquids and solids.	True	False
4) The particles in liquids are packed tighter than in solids.	True	False
5) The density of matter depends on its mass and volume.	True	False
6) Density can be measured in kg/m^3 or g/cm^3	True	False

Name: _____ 28

Curriculum Connection
C2.2

Calculating Density

Calculating Density

To calculate the density of matter, we need to know the mass and volume of the matter. We can use the following formula with a gas, liquid, or solid to determine its density.

$$\text{Density} = \frac{mass}{volume}$$



For example, if a phone has a mass of 200 g and a volume of 75 cm^3, we input these values into our equation to determine the volume.

$$\text{Density of phone} = \frac{200}{75} = 2.66 \text{ g/cm}^3 \text{ or } 2660 \text{ kg/m}^3$$

Calcu Calcu ensity using the formula above to two decimal places.

		Volume	Density
1)		100 cm^3	
2)	1200 kg		
3)	250 g		
4)	485 kg	1100	
5)	626 g		
6)	224 g	68 cm	
7)		854 m^3	
8)	1680 kg		
9)		2285 cm^3	1. cm^3
10)	1020 g		4.2 g/cm^3

PREVIEW

Word Problem Answer the questions below.

1) A plastic toy car has a mass of 220 grams and a volume of 315 cm^3.	
a) What is the density of the toy?	
b) Water has a density of 1 g/cm^3. Will the toy float in the water or sink to the bottom? Explain.	

Name: _____ 30

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

Experiment – Densities of Solids

Hypothesis Rank the solids in order from highest density to lowest density.

1)	2)	3)
4)	5)	6)

Mater W u need for the experiment?

- ❑ Scale to tes balan tal scale
- ❑ Cylinder with m asu sure displacement
- ❑ 6 solids to test – ma chip raser, paper clip, ping pong ball, etc.
- ❑ Optional – if using soli at, d to use a sinker. A **sinker** is a heavy/dense object that yo n ti ject. You will need to determine the volume of the sinker first and it fr otal volume of the sinker and the floating object to find the v ne of j e fl g object.

Procedure How will you complete the expe e

1) Complete the hypothesis by writing the solids you wil in top of the page.
2) Rank them in order of which solids you think will be most den e t ense.

Calculating the volume of the solids – Use backside of the paper to rec results.

1) Fill the cylinder up with water to a measurable line.
2) Drop a solid into the cylinder.
3) Measure in mL how much water is displaced by calculating the difference between the starting water level by the current water level. Note: 1mL is the same as 1 cm^3 volume.
4) Write down the volume in cm^3.

Calculating the mass of the solids – Use backside of the paper to record results.

1) Use the scale or balance to measure how much mass the solids have.

Calculate the density of the solids

1) Fill in the table on the back side of this page using the formula: density = $\frac{mass}{volume}$

PREVIEW

© Super Simple Sheets

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

Observations

Fill in your measurements below.

Solid	Volume – cm^3	Mass - g	Density – g/cm^3

PREVIEW

Results

Answer the questions b

1) Was your hypothesis correct? Did anything st you

2) Why do you think the water level goes up when the solid is put into the er?

3) Why would you need a sinker if you used a floating object?

© Super Simple Sheets

Name: _____ 32

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

Experiment – Densities of Liquids

Hypothesis Rank the liquids in order from highest density to lowest density.

1)	2)	3)	Optional 4)

Materials What will you need for the experiment?

- ❑ 1 la beake
- ❑ 3 or 4 liqu s: v le oil, water, corn syrup, maple syrup. Do not use liquids t diss
- ❑ Food colouring

Procedure How will you c plet

1) Complete the hypothesis by writing the li you in the boxes at the top of the page.
2) Rank them in order of which liquids you think the hi density to lowest density.
3) If you use water, place a few drops of food colouring in the is easier to tell it apart from other clear liquids.
4) Pour all the liquids together into the beaker or large jar. Let it s e.
5) Fill in the observations of what you noticed about the settling of the liquids.

Observations What did you notice as you completed the experiment?

1) Write the actual order of the liquids after you have completed the experiment.

_____

_____

_____

PREVIEW

© Super Simple Sheets

2) Draw a diagram of the liquids in the beaker. Label each layer of the liquids.

PREVIEW

Results

Answer t[illegible]ons b[illegible]

1) Was your hypothesis correct? Did an[illegible]rpris[illegible] Explain.

2) Which liquids have a higher density than water? Which hav[illegible]low[illegible] water?

Higher	Lower

3) Did any of the liquids dissolve in the water? How would that affect the experiment?

© Super Simple Sheets

Name: _____ 34

Curriculum Connection
C2.2

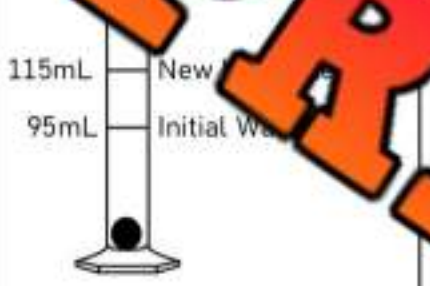
Calculating Density and Volume

Calculating Volume and Density
To calculate the volume of an irregular object, we can put it into water to see how much water is displaced. We do this by measuring the initial water level and subtract it from the water level after the object has been placed. Every 1 mL of water equals 1 cm^3 of volume.

Calculate Calculate the density using the formula above to two decimal places.

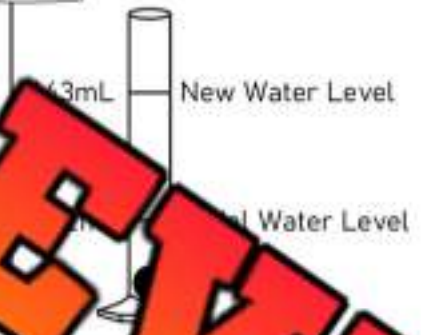
PREVIEW

1)



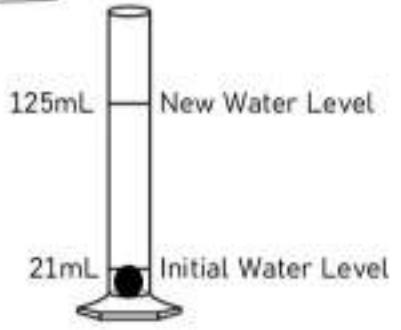
Volume	
Mass	40 g
Density	

2)



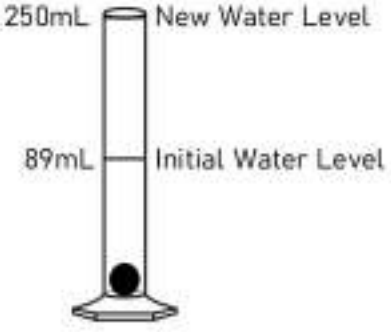
Volu	
Mass	g
Density	

3)



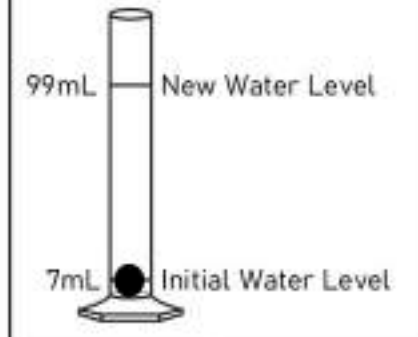
Volume	
ass	260 g
De	

4)



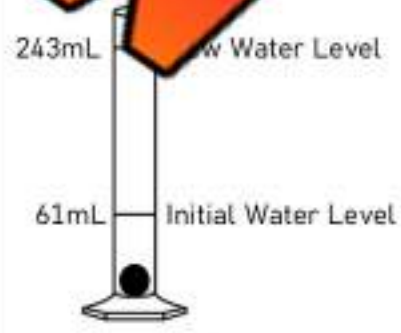
Volume	
Mass	
Density	0.5 g/cm^3

5)



Volume	
Mass	
Density	1.3 g/cm^3

6)



Volume	
Mass	
Density	3.5 g/cm^3

© Super Simple Sheets

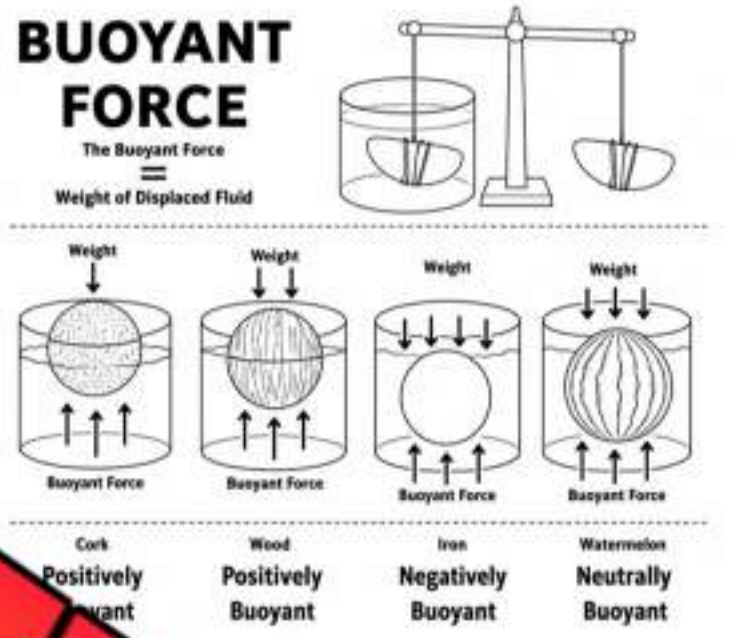
Name: _____ 35

Curriculum Connection
C2.5

Buoyancy

What is Buoyancy?

Buoyancy is an upward force created by a fluid that opposes the weight of an object. Buoyancy is why an object sinks or floats when put into a fluid, like water. All objects in water have some buo force pushing up against th that is pulling that object d yant force is not s the object out of ater, i



Types of Buoy

Positively Buoyan

An object, like cork, buoyant if its density is l the fluid it is in. The result will b e in the fluid. In the diagram, cork is more positively buoyant than wood, b water, meaning they rest at the surface because their density is l the w are both said to be positively buoyant.

Negatively Buoyant

An object is negatively buoyant if it sinks in water. If the has a higher density than the fluid, it will be negatively buoyant. N buoy jects vary, meaning some negatively buoyant objects will take time , w tively buoyant objects will sink right away, like a large rock. This is beca ave different densities.

Neutrally Buoyant

A neutrally buoyant object does not sink or float. Instead, it remains balanced at the same level in a fluid. Scuba divers aim to be neutrally buoyant so they cannot feel the force of gravity or buoyancy while they explore underwater. They do this by wearing scuba gear that balances these forces. They use equipment to balance their density so that it is equal to the water's density of 997 kg/m^3.

Buoyancy of Humans

Some humans have an easier time floating than others. Bone density and body fat percentage affects buoyancy in humans. This is because bone is denser than water, so the thicker the bones someone has, the more they will be negatively buoyant. In addition, fat is less dense than water, so the more body fat someone has, the more they will be positively buoyant.

PREVIEW

Name: _____ 36

Curriculum Connection
C2.5

Questions

Use information from the text to support your answer.

1) Define the buoyancy terms below.	
Positively Buoyant	
Negatively Buoyant	
Neutrally Buoyant	

2) How does density affect the buoyancy of an object?

Examples

What objects are positively buoyant, negatively buoyant, and neutrally buoyant?

Positively Buoyant	
Negatively Buoyant	
Neutrally Buoyant	

True or False

Circle whether the statement is true or false.

1) Steel is positively buoyant.	True	False
2) A good life preserver will be positively buoyant.	True	False
3) Boats are negatively buoyant.	True	False
4) A scuba diver aims to be neutrally buoyant so that can move easier.	True	False
5) A neutrally buoyant object floats for awhile and then sinks.	True	False

PREVIEW

Exit Cards

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

Name: _____

How does the balance between buoyant force and gravity determine whether an object floats, sinks, or remains suspended in water?

Name: _____

How does the balance between buoyant force and gravity determine whether an object floats, sinks, or remains suspended in water?

Name: _____

How does the balance between buoyant force and gravity determine whether an object floats, sinks, or remains suspended in water?

Name: _____

How does the balance between buoyant force and gravity determine whether an object floats, sinks, or remains suspended in water?

PREVIEW

© Super Simple Sheets

Name: _____ 38

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

Experiment - Buoyancy of Water

Materials

What do we need for our experiment?

- ❑ 3 clear cups or glasses that can fit an egg
- ❑ 1-3 eggs – one will work if you take the egg out each time to test the water
- ❑ 8 tablespoons of salt and sugar
- ❑ Water
- ❑ Spoon



Procedure

How do we complete the experiment?

1) Fill the 3 cups with water.
2) Label the cups on the bottom with the labels – saltwater, control, and sugar water.
3) Put the 8 tablespoons of salt into the saltwater. Stir well to dissolve the salt into the water.
4) Put the 8 tablespoons of sugar into the cup labelled sugar water. Stir well to dissolve the salt into the water.
5) Put the egg in the control glass of water and record what happened. Is the egg buoyant in the water?
6) Put the egg in the sugar water and record what happened. Is the egg buoyant in the sugar water?
7) Put the egg in the saltwater and record what happened. Is the egg buoyant in the saltwater?

PREVIEW

Hypothesis

Will the egg be buoyant in water, saltwater, sugar water? Rank the types of water providing the most buoyancy to least buoyancy.

Fluid	Buoyancy	
Water	Yes	No
Sugar Water	Yes	No
Saltwater	Yes	No

Fluid	Rank 1 = most buoyant, 3 = least buoyant
Water	
Sugar Water	
Saltwater	

© Super Simple Sheets

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

Observations

Fill in the tables below based on your observations.

Fluid	Buoyant	
Water	Yes	No
Sugar Water	Yes	No
Saltwater	Yes	No

Fluid	Rank 1 = most buoyant, 3 = least buoyant
Water	
Sugar Water	
Saltwater	

Results

Answer the questions below.

1) W[illegible]ect? Did anything surprise you? Explain.

2) Why was the egg buoyant i[illegible]? Explain using the terms density, volume, and mass.

3) Could someone using the same amount of salt and sugar, but dif[illegible] water get different results? Explain.

4) If you wanted to increase the buoyancy of the water, what could you do? How could you increase the buoyancy of the water so that the egg barely sinks at all.

PREVIEW

© Super Simple Sheets

Name: _____ 40

Curriculum Connection
C2.5

Determining Buoyancy of Objects

Determining Buoyancy of Objects
We can determine if an object will be positively, negatively, or neutrally buoyant by understanding the density of the object and the fluid it is in. If the object has a higher density than the fluid, it will be negatively buoyant (not buoyant). Some objects will float in water but not in other fluids that have higher densities.

Buoyancy Is the object buoyant in the fluid?

	Object			Fluid			Buoyancy	
	Mass	Volume	Density	Mass	Volume	Density		
1)	120 g			200 g	110 cm^3		Yes	No
2)	250 g	325 cm^3			600 cm^3		Yes	No
3)	1.3 kg	3.2 m^3		kg			Yes	No
4)	480 g	110 cm^3		500	00 c		Yes	No
5)	12.5 kg	18.55 m^3		22.2 kg	10.		Yes	No

PREVIEW

Word Problem Answer the questions below.

1) Jill is measuring the density of ketchup. The ketchup has a volume of 400 cm^3 and a mass of 592 g.	
a) What is the density of the ketchup?	
b) Water has a density of 1 g/cm^3. Could an object float in ketchup and sink in water? Explain.	
c) A crayon has a mass of 12 g and a volume is 11 cm^3. Is the crayon buoyant in water? Is the crayon buoyant in ketchup?	

© Super Simple Sheets

Name: _____ 42

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

Experiment – Buoyancy in Different Fluids

Materials

What will you need for the experiment?



- ❑ 3 cups or beakers
- ❑ 3 different fluids (water, corn or maple syrup, molasses, oil)
- ❑ 5 diff objects with differing densities (stone, paper clip, cork ping pong ball, tangerine)

PREVIEW

Proce e

ill you complete the experiment?

1) Fill each cup he fl a
2) Drop each object in d an whether it was buoyant or not.
3) Answer the questions on the res e.

Hypothesis

Which objects will be buoyant luids sing?

	Fluid 1	Fl	Fluid 3
Object 1			
Object 2			
Object 3			
Object 2			
Object 3			

© Super Simple Sheets

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

Observations

Fill in the tables below based on your observations.

	Fluid 1	Fluid 2	Fluid 3
Object 1			
Object 2			
Ob			
Ob ct 2			
Object 3			

PREVIEW

Results

Answer the questions be

1) Was your hypothesis correct? Did anything s you

2) Which fluid gives the strongest buoyant force? Which was the least? H o you know?

3) What would happen if you poured each of these liquids into one jar? Explain.

© Super Simple Sheets

Name: _____ 44

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

Activity - Making A Floating Boat

Introduction — What are we making?

Can you make a tinfoil boat that floats and can hold weights inside?

Materials — What do we need for our experiment?

- Al[illegible]rfoil – [illegible]30 cm long per boat
- Scissors – [illegible]
- Tape – optiona[illegible]
- Weight – pieces of cl[illegible]s, marb[illegible]



Method — How do we complete [illegible]

1. Design your boat by deciding what shape [illegible]be.
   a) Will it have a flat or pointed bottom?
   b) Will it be long and narrow like a canoe or more square?
2. Fold the tinfoil several times until you have a thicker material.
3. Fold in the outsides of your boat's walls. Make the walls high enough that they do not let water in.
4. Fill a bowl with water to test your boat in.
5. See if your boat floats on its own. Then add weights. How many weights can your boat hold?



PREVIEW

Name: _____ 45

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

Plan Answer the questions below about your plan.

1) Will your boat be a flat bottom or rounded bottom?

2) Will your boat be long and narrow or more of a square shape?

3) Draw a [illegible] for your boat below.

PREVIEW

Results Answer the questions below.

1) Did your boat float on its own?

2) How many weights did your boat hold?

3) What could you have done better if you made another boat?

_____

_____

_____

© Super Simple Sheets

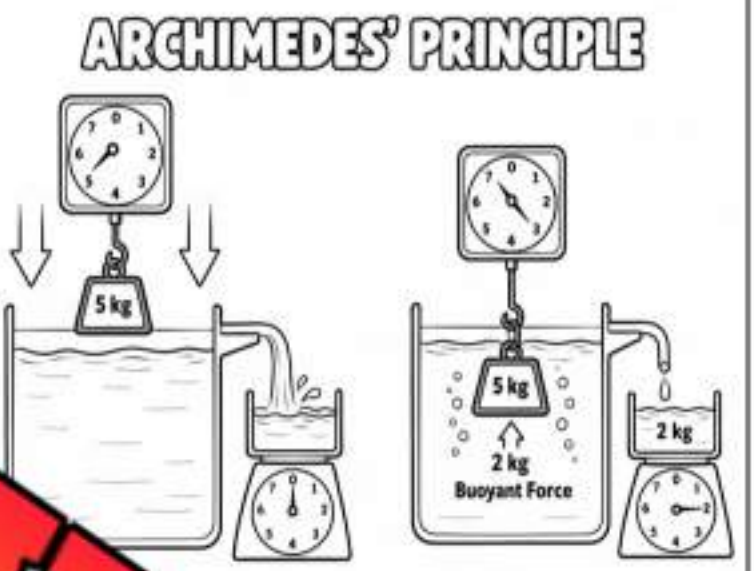
Name: _____ 46

Curriculum Connection
C2.5

Archimedes' Principle

What is Archimedes' Principle?

Archimedes' principle is that the buoyant force (upward force) is equal to the weight of the displaced water. Looking at the diagram, you'll notice that in the first image, the 5 kg weight is not yet in the water. Therefore, no water has spilled onto the s yet.



In t d image, you can see that the t entered the wate spill out onto the sc he 5 k s caused 2 kg to be dis eig the displaced wate oyan the upward force use objects to float.

PREVIEW

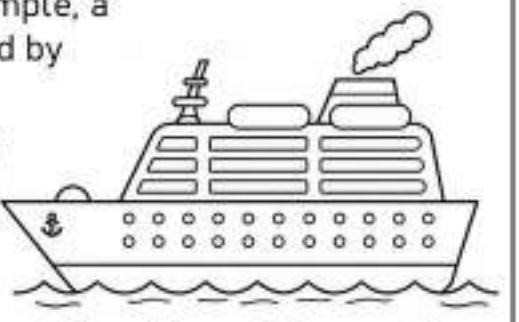
Sink or Float?

If the object's weight is heavier an th ater that was displaced, the object will sink. In our example, the 5 ght is avier than the weight of the water that was displaced, therefore this weight w k. I r words, the weight (downward force) is heavier than the buoyant rd) fo g it to sink to the bottom.

On the other hand, if the object displaced wate ghed han its weight, the object would float. The buoyant force woul ge its ight, causing it to move upwards.

Importance of Archimedes' Principle

Boats need to understand Archimedes' principle because boats need t mewhat submerged in the water in order to generate energy to propel it forwa Boats also need to be strong, which is why they are made of strong, heavy materials. Heavy materials are often dense, causing them to sink. For example, a screw will sink because the weight of the water displaced by the screw is less than its own weight.



Luckily, ship engineers know that to make a strong and buoyant ship, they need to make sure the ship displaces more water than its weight. This means making their ship less dense. They accomplish this by keeping most of the ship hollow. If they filled in the ship or had too many containers on board, the density of the ship could cause the displacement to be less than the weight of the ship itself. This would cause it to sink.

Name: _____ 47

Curriculum Connection
C2.5

Questions
Use information from the text to support your answer.

1) What is Archimedes' principle? Explain how it works.

2) How do[illegible] need to be built so that it can be buoyant in water? Explain.

PREVIEW

Diagram
Draw your [illegible]ram [illegible]g Archimedes' principle.

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

1) If an object displaces more weight than its weight, it will sink.	True	False
2) A ship needs to be built hollow so it can be positively buoyant.	True	False
3) If a ship displaced less water than its weight, it will sink.	True	False
4) Archimedes' principle explains why water levels rise when we enter water.	True	False
5) The buoyant force is always the same as the downward force of the object.	True	False

Name: _____ 52

Activities – Flow and Buoyancy



Word Search

Find the words from the word bank.

Flow	Fluid	Viscosity	Temperature	Particles
Rate	Container	Mass	Volume	Density
Buoyan	Sink	Float	Archimedes	Displaced

PREVIEW

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

Word Scramble

Unscramble the words from the word bank.

ETUERMRETAP		TVSOCYSII	
TYSNDEI		MVOLEU	
CADRSEMHIE		WOLF	
UDILF		TFAOL	
OANECNTRI		ITEPARCSL	

© Super Simple Sheets

Name: _____ 53

Curriculum Connection
C2.6

Lighter-Than-Air Flying Devices

Lighter-Than-Air Flying Devices

A **lighter-than-air flying device** is an airship that generates lift because they use gases that are lighter than air. Most commonly, these airships use helium as the gas because its density is significantly less than air, and it is cheaper to buy than other gases. The density of air is 1.225 kg/m^3 and the density of helium is 1.114 kg/m^3.

How Airs[illegible]- Helium Balloons

An ai[illegible]s i[illegible]altitude the same way a submarine does, through buoyancy. [illegible]an[illegible]is the ability to float. Airships use helium to fill their [illegible]ballon[illegible]g the air in these huge holding tanks less dense [illegible]han[illegible]f them. When the air is less dense, it rises a[illegible]ir in t[illegible]here that is heavier. This makes the airship positively buoyant, and m[illegible]s it [illegible]



When the pilot needs to go up, th[illegible]helium [illegible]allonet. When they need to go down, they pump air into the ballonet to make th[illegible]ativel[illegible]t. When they are at an cruising altitude, they balance the amount of air a[illegible]ium [illegible]o stay at the same altitude.

Hot Air Balloons

A hot air balloon is another lighter-than-air flying device that uses th[illegible] same principle as the helium airships. They both need the air in the balloon to be less dense than the air outside of the balloon. This allows them to achieve buoyancy in the air, which gives them lift.



A hot air balloon uses heated air inside the balloon. Heated air is less dense than the surrounding air in the atmosphere. This is because when air is warmed, the molecules move faster and further apart. This causes the warmer air to expand and spread out, making it less dense. Less dense things float, like the ice in a glass of ice-water. To go up in a hot air balloon, the pilot will heat the air using a torch. To go down, the pilot stops heating the air, which causes the air to cool and gravity to pull the balloon down.

PREVIEW

© Super Simple Sheets

Name: _____ 54

Curriculum Connection
C2.6

Scenarios

How do you achieve the results below when flying a lighter-than-air device?

1) In an airship, you want to go down.
2) In an airship, you want to go up.
3) In a hot air balloon, you want to go down.
4) In a hot air balloon, you want to go up.

True or False

Determine whether each statement is true or false.

1. Helium is rarely used in airships because it is expensive and flammable.	True	False
2. Air can be heated to make it less dense.	True	False
3. An airship is a lighter than air flying device.	True	False
4. When an airship is negatively buoyant, it will rise.	True	False
5. To go down in a hot air balloon, you need to add ice to the air.	True	False

Questions

Use information from the text to support your answers.

1) What is a lighter-than-air flying device? How do they use buoyancy to fly?
2) How does a lighter-than-air flying device achieve lift?

PREVIEW

© Super Simple Sheets

Name: _____ 58

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

Experiment – Power of Air Pressure

Background — Does air pressure exist?

Most of the time, we can't feel air pressure. But, did you know that right now there is about 15 pounds of air pressure pushing down on every inch of your body? We don't feel it because we have air pressure in our bodies as well that is pushing outwards at the same pressure. This means the air pressure is equalized.

Sometimes the air pressure acting on us becomes unbalanced. When we take an elevator to the 10th floor of a building, the air pressure around us decreases, but the air pressure in our bodies doesn't decrease as fast. The pop you feel in your ears is your body rushing to balance the air pressure inside your body with the lower air pressure outside.

Research Question — Is air pressure strong enough to hold water?

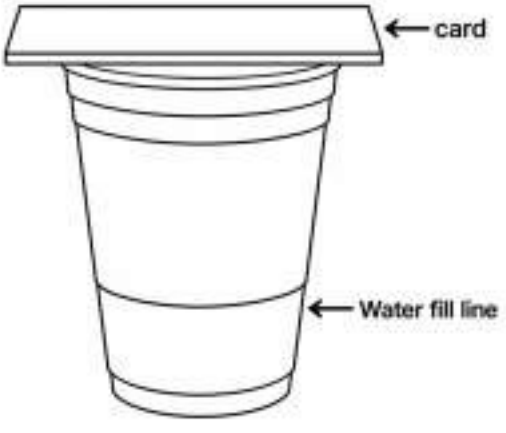
If we fill a cup 1/4 with water, will it hold the water in the cup when it is tipped upside down? The air pressure inside the cup is less than the air pressure outside the cup.

Hypothesis — Will the water or the air hold the water in place?

Materials — What you need for this experiment

- Water
- Cup
- Card that is large enough to cover the opening of the cup

Procedure — What to do



1. Fill the cup one quarter full of water
2. Put the card over top of the opening of the cup
3. Walk over to a sink (or do this outside)
4. Tip the cup upside down – Did the card hold the water in the cup or did it spill?
5. If the water spills, try it again using less water

PREVIEW

© Super Simple Sheets

Name: _____ 59

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

Diagram Draw a picture of the experiment. Label the air pressure using arrows. Use smaller arrows for lower air pressure and larger arrows for higher air pressure.

Results ...pened during the experiment?

1) Was your hypoth... corre... d ...ter spill or not?

2) Why wouldn't the water fall out of th... Expla... ...following terms: gravity, air pressure, higher, lower.

3) Why do our ears pop when we travel to higher elevations? (airplane, m..., elevator)

4) When have you felt different air pressures in your life? Explain.

PREVIEW

© Super Simple Sheets

Name: _____ 60

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

Experiment – Air Compression

Background

Can we squeeze air and compress it?

Air is all around us. We can't see it, but it is actually a fluid that we live in. There are tiny gas particles floating around us all the time. Open your hand and grab some air. Squeeze the air in your hands. Did you feel anything? No, because the air escapes out of your hand. But can we squeeze air and compress it? Let's try!

Research

Can we compress air?

Can w[illegible] inside a reusable water bottle by squeezing the end of the bottle while [illegible] is on? The amount of air will still be in the bottle, but the bottle will be smaller. What will [illegible] we release the bottle's lid?

Hypothesis

[illegible] the air [illegible] compressed? What will happen with the lid?

Materials

What will you need for this experiment

- Empty plastic water bottle (reusable bottle that you [illegible]

Procedure

What to do



1. Make sure the bottle is empty and only fi[illegible]th air.
2. Tighten the lid so no air can escape. We want to make sure the air inside gets compressed, instead of escaping out of the lid.
3. Twist the bottle's larger end on the opposite side of the lid. Twist until the bottle is about half of the size that it was before.
4. CAREFULLY loosen the lid. MAKE SURE NO ONE IS NEAR THE BOTTLE'S LID. DO NOT POINT THE BOTTLE AT ANYONE.
5. If nothing happened, try again by blowing air back into the bottle, inflating it again.

PREVIEW

© Super Simple Sheets

Name: _____ 61

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

Diagram

Draw two diagrams:
1. The squeezed bottle with the lid on. Label the compressed air
2. The opened bottle. Label the lid flying, the air direction using arrows





PREVIEW

Results What happ ing ment?

1) What is air compression? What does n to co a?

2) Was your hypothesis correct? Was the air compressed inside of t you know?

3) Why did the bottle lid go flying through the air? If you squeezed the bottle more, would the lid have flown further?

© Super Simple Sheets

Name: _____ 62

Curriculum Connection
C2.6

Mishandling of Compressed Gases

Air Pressure

Gas particles move randomly in the container they are in. In the room you are in now, the gas particles in the air are moving all around you. The air pressure is not very strong, as the space these particles occupy is large, keeping the air pressure low.

When we compress a gas, we seal a lot of gas particles it inside a relatively small container. Inside the container, the particles are exerting a force on the container walls as they bo off each other and the walls of the container. The force and pressure is equal thro he entire container as the particles spread out evenly.

Co canisters need to be built strong with thick steel materials so their th he force created by the moving gas particles.

Mishand g of C Gas

When gases in are their particles increase in average speed. They colli each r, causing their force to be increased on the wa th is increase in force is due to the increase in air press

If the containers heat gh, ure inside could cause an explosion. That is why ne compressed gases are kept away from heat source ding t sun. It is best to keep compressed air cylinders in sha , cool e nme here the internal air pressures will be kept consta

Most explosions caused by compressed g han compressed gas cylinder leaks a flammable gas and n sou ns the gas. For example, if someone lights a flame in the same roo s a ak e flame could ignite the gas causing the compressed gas cylinder t plo



Everyday Uses of Compressed Gases

Compressed gases are used by most people in their everyday lives. Fo example, soda has carbon dioxide gas compressed inside the soda can. You won't find soda inside a cardboard box, like a juice box, because the cardboard material is not strong enough to withstand the carbon dioxide's pressure. Instead, soda is inside an aluminum can that is strong enough to contain the gas' pressure.

Compress gas is also found in whipped cream canisters, hair sprays, and air compressor tanks used to fill a vehicle's tires. It is important that we handle these compressed gas containers with care, keeping them away from heat sources.

In a hair spray or spray paint, there are two different substances: the liquid you want like the paint or hair product and a pressurized gas called a propellant. The contents of the can are pressured 2-8 times more than the atmospheric pressure. So when you push the button, the compressed air escapes into the area of lower pressure.

PREVIEW

Name: _____ 63

Curriculum Connection
C2.6

Questions Use information from the text to support your answer.

1) What is air pressure? Describe the air pressure inside a compressed gas cylinder?

2) H… …es be dangerous? How can we store compressed gases safely?

PREVIEW

Poster Draw a poster below that shows people… …ressed gases safely.

© Super Simple Sheets

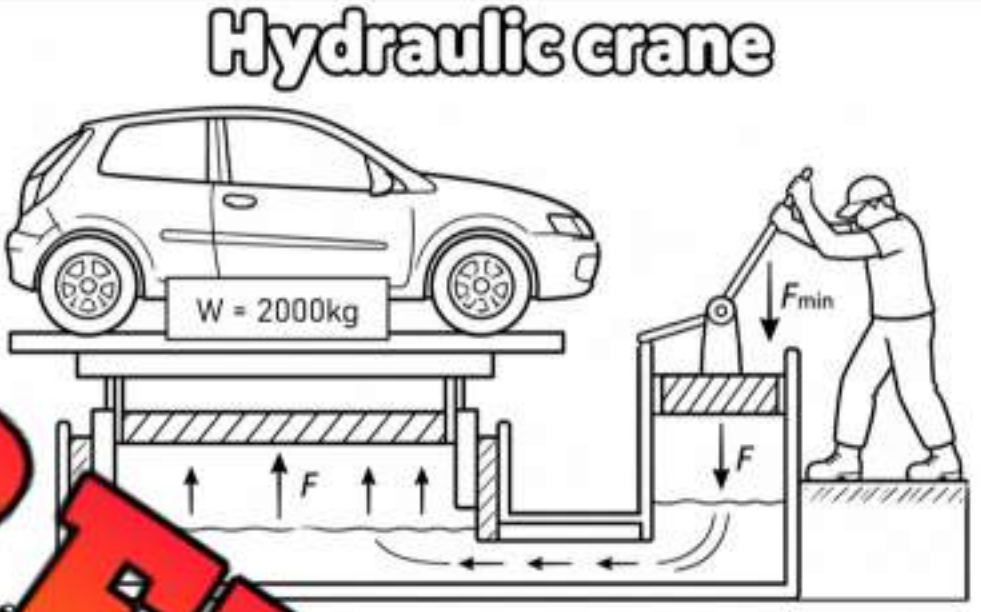
Name: _____ 66

Curriculum Connection
C1.1, C2.4, C2.7

Pascal's Law - Hydraulics

What is Pascal's Law?

Pascal's Law states that a pressure change at any point in a confined incompressible fluid is transmitted throughout the fluid a[illegible]ts on the walls of th[illegible]ner equally.



PREVIEW

expla[illegible] hydra[illegible] systems work. Wh[illegible] apply pressur[illegible] of an incompress[illegible]d, the fluid acts on ever[illegible] the enclosed container. If [illegible]re is [illegible]ough, it will move container walls, like the slave piston in a hydraul[illegible].

The multiplication factor a[illegible]ws m[illegible]e. Pascal's principle states that if the slave piston has an area 5 times g[illegible]than th[illegible]e first piston (master), the force will be 5 times greater on the slave[illegible]iston.

In the diagram, the worker mechanic nee[illegible] the [illegible]r. This would be impossible without a mechanical advantage. Let's [illegible]me [illegible]on factor is 10, guessing that the area of the slave piston is 10 times [illegible] the m[illegible]iston. In this case, we can use the following equation to determine th[illegible]ede[illegible]

$$\text{Force} = \frac{weight}{multiplication\ factor}, \text{ therefore, Force} = \frac{2000\ kg}{10} =$$

Use of Hydraulic Systems

Hydraulic systems are used in heavy equipment, like forklifts, backhoes, and excavators.

Advantages

- Simple and safe due to using less parts than mechanical systems
- Great control as push buttons can make it easy to start, stop, accelerate or decelerate
- The most powerful option for creating force

Disadvantages

- Hydraulic fluids can be messy and can leak if a valve or pipe is damaged
- Hydraulic fluids can be corrosive and are flammable
- The fluids in a hydraulic system can freeze. Most hydraulic fluids have a freezing point of -12 degrees Celsius, so using these systems in the winter can be problematic

© Super Simple Sheets

Name: _____ 67

Curriculum Connection
C1.1, C2.4, C2.7

Questions

Use information from the text to support your answer.

1) What is Pascal's Law? Explain how it relates to hydraulic systems.

2) H[illegible]tem work?

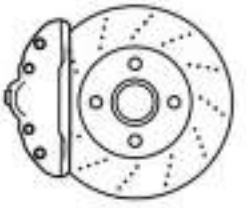
PREVIEW

Word Problems

Answer the word pr[illegible]tems be

1) Shane is using a hydraulic system to lift a car [illegible] 1800 [illegible] area of the slave piston is 120 cm^2 and the area of the maste[illegible] 20 [illegible]w much force does he need to put into the handle?

2) Sheena pushes on the breaks to stop her car. She applies 20kg of force to the pedal, which is connected to a master piston that is 35 cm^2. The brake pads are connected to a slave piston that has an area of 280 cm^2. How much force did she apply into the brake pads?



© Super Simple Sheets

Curriculum Connection
C1.1, C2.4, C2.7

Exit Cards

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

Name: _____ Mark

Fill in the blank space.

1) Pressure in a confined fluid spreads _____ in all directions.

2) Hydraulic systems use _____ fluids to transfer force.

3) Larger pistons produce greater _____.

4) A multiplication factor of 5 increases force by _____ times.

5) Damaged hydraulic pipes can cause fluid _____.

Name: _____ Mark

Fill in the blank space.

1) Pressure in a confined fluid spreads _____ in all directions.

2) Hydraulic systems use _____ fluids to transfer force.

3) Larger pistons produce greater _____.

4) A multiplication factor of 5 increases force by _____ times.

5) Damaged hydraulic pipes can cause fluid _____.

Name: _____ Mark

Fill in the blank space.

1) Pressure in a confined fluid spreads _____ in all directions.

2) Hydraulic systems use _____ fluids to transfer force.

3) Larger pistons produce greater _____.

4) A multiplication factor of 5 increases force by _____ times.

5) Damaged hydraulic pipes can cause fluid _____.

PREVIEW

Name: _____ 69

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

Coding – Automating a Hydraulic System

Hydraulic Systems

A hydraulic system works by using incompressible fluids to exert a stronger force in another area. A simplified version of the steps below is listed:

1) A small force is used on one side of the hydraulic system. Often this is pulling a lever or pushing a break pedal
2) The incompressible force (a liquid) is moved throughout the system into a larger chamber that increases the force.
3) The force is now transmitted to the other side and is much stronger. So, the original weak force is now multiplied. Often, this side of the hydraulic system will move a heavy load, such as an excavator.

If we were designing a hydraulic system, we could use a robot to complete the steps. If the hydraulic system was in an excavator, we would want to repeat these steps multiple times in order to move multiple loads of dirt or rocks.

Efficient Code: Sub-Programs

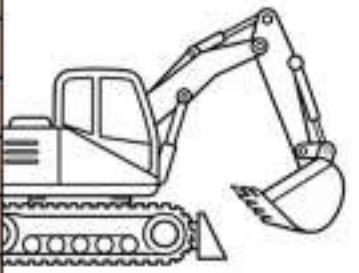
If we know the steps for a program will be used over and over again, we can create a sub-program with these steps that simply refers to something we can refer to later. Check out the sub-program of an excavator's hydraulic system below.

define hydraulics
pull lever with small force
fluid travels through small chamber and to larger chamber
bucket is moved based on the directions the lever moves it

Now, we can refer back to this entire set of code with just two words. This sub-program is named hydraulics and we can use run the sub-program to run the entire block of code, stating "hydraulics."



drive excavator in front of stone pile
run hydraulics
move bucket down
move bucket up to scoop stone
drive excavator to parking lot
run hydraulics
move bucket down to dump stone



Using a sub-program is more efficient. We could change one part of the sub-program and have that change be reflected in an entire page of code. Without the sub-program, you would need to make the same change multiple times.

PREVIEW

Name: _____ 70

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

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

1) Sub-programs make more work for the coder.	True	False
2) Using a sub-program is more efficient.	True	False
3) Making a change to a sub-program is difficult.	True	False
4) We can refer to a sub-program that will then run a list of commands.	True	False
5) We sho[illegible] use sub-programs when we have repeatable actions.	True	False

Questi[illegible] [illegible] questions below using evidence from the text.

1) What is a su[illegible]

2) Why is a sub-program more efficien[illegible]

PREVIEW

Directions Write your own sub-program for running the dishwasher. W[illegible]he commands in order of first step to last.

define dishwasher

© Super Simple Sheets

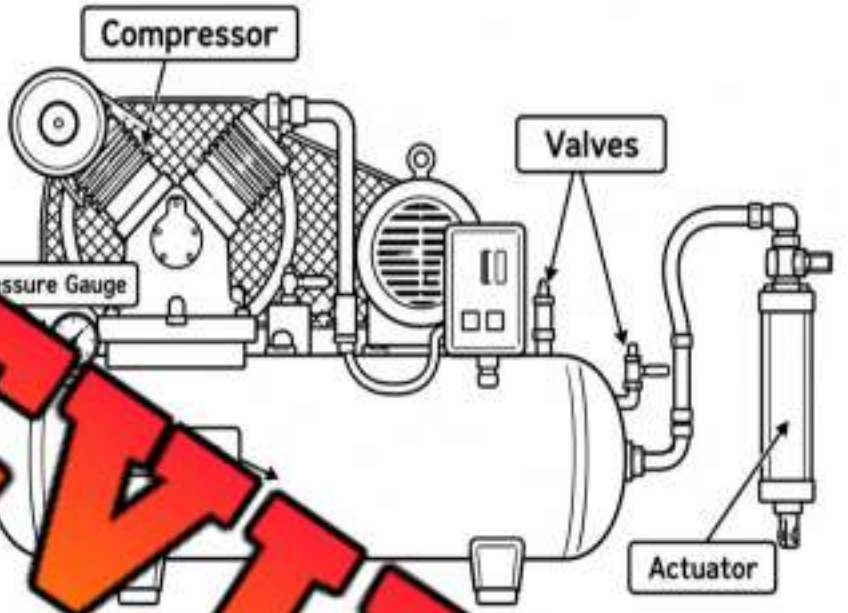
Name: _____ 71

Curriculum Connection
C2.4, C2.9

Pneumatic Systems

What is a Pneumatic System?
A **pneumatic system** is like a hydraulic system, but they use compressed air instead of fluid to transmit forces. Pneumatic systems work by using pressurized air to create forces that can perform work. A pneumatic system has the components below.

1) Air Compressor
An air com[illegible]sor is a pneumati[illegible]t converts the air in th[illegible]to com[illegible]the compre[illegible]and i[illegible] compressed b[illegible]t reduces the vo[illegible]e air. The pressurized ai[illegible] to leave the tank and e[illegible] receiver. Air compressors [illegible] often fueled by a gas tank or b[illegible] electricity.



PREVIEW

2) Receiver
The receiver stores the pressurized air from t[illegible]pre[illegible]es it in a bigger tank. An air receiver is able to smooth the flow o[illegible]it [illegible]enters the tank. This is because a larger tank can dissipate heat [illegible]ker [illegible]smaller tank. The air receiver stores the compressed air at an even hig[illegible]ess[illegible]to compensate for the cooling air that reduces its pressure.

3) Air Valves
Air valves stop and change the direction of the air. They control the direction of the airflow so that the system can deliver the air to the correct cylinders, actuators, and nozzles. These valves can be manual, requiring the user to open and close a valve. They can also be electrical, allowing the user to press a button to open and close a valve.

4) Pneumatic Actuators
Pneumatic actuators are the devices that convert the energy of compressed air or gas into mechanical motion. When pressurized gas enters a chamber, it results in the kinetic movement of a device, such as a piston or gear. The piston will create linear (straight line) motion, while the gear will create rotary motion. We can then use this mechanical motion to perform work, like moving a robotic arm that lifts heavy equipment.

© Super Simple Sheets

Name: _____ 72

Curriculum Connection
C2.4, C2.9

Questions

Use information from the text to support your answer.

1) What is a pneumatic system? How is it different than a hydraulic system?

2) How d[illegible]uator create linear and rotary motion?

PREVIEW

Questioning

Write 3 questions yo[illegible]oout [illegible]eading.

1)	
2)	
3)	

True or False

Circle whether the statement is true or false.

1) A pneumatic system uses pressurized gas to generate power.	True	False
2) Air compressors are large tanks that store pressurized air.	True	False
3) A receiving tank cools the temperature of the pressurized air.	True	False
4) When pressurized air is cooled, it increases its pressure.	True	False
5) A gear creates linear motion that can be used for straight line work.	True	False

© Super Simple Sheets

Name: _____ 73

Curriculum Connection
C2.4, C2.9

Research – Pneumatic Systems



Research Answer the questions below.

1) What is a pneumatic system?

2) What are some every[illegible]of pn[illegible]systems?

3) When have you ever used, or seen someone else use a pneumatic[illegible]m? Explain the work that was done.

PREVIEW

Curriculum Connection
C2.4, C2.9

4) What are the advantages and disadvantages of a pneumatic system?

Advantages	
Disadvantages	

PREVIEW

5) In freezing temperatures below –12 degrees Ce... ...ich sy... ...ould be better – hydraulic or pneumatic?

6) Research the use of a pneumatic system. Explain how it works.

© Super Simple Sheets

Curriculum Connection
C2.8

Factors Affecting the Flow of Fluids

What is the Flow of a Fluid?

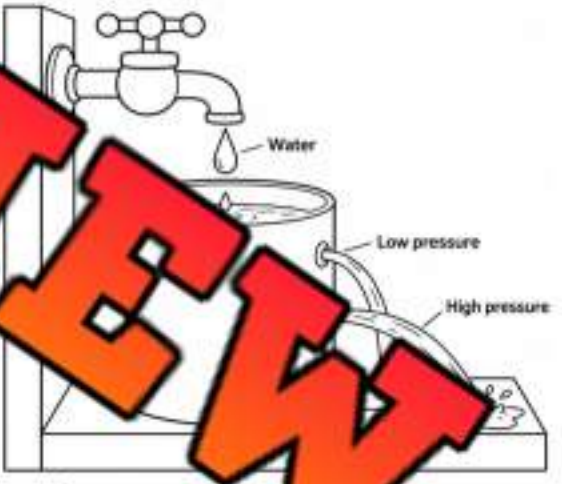
The **fluid flow** is the motion of a fluid that happens because of unbalanced forces. For example, in a river, the water flows downhill, due to gravity. Therefore, the current in a river will flow downhill because the force of gravity is pulling the water towards a level surface.

The flow of a fluid is affected by many factors, including the temperature, pressure, [illegible]sity, and density.

PREVIEW

1) Temp[illegible]

The t[illegible]or[illegible] affects how a fluid will flow. As the temperature of a fluid increa[illegible]he mo[illegible]e[illegible]ve faster, meaning they have more kinetic energy. An increase in kin[illegible]edu[illegible]the forces of intermolecular attraction, which means the molecules [illegible]r apar[illegible]ample, when you heat oil in a pan, it will pour slowly, but once h[illegible]the [illegible]nner and will spread out more. [illegible]ll [illegible]h faster throughout the pan.



2) Pressure

Fluids are under constant pressure. A[illegible] exerts more pressure at greater depths. This is because the deeper the fluid, the more fluid there is o[illegible] pushing down on top. In the diagram, you can see that the hole in the bottom creates the strongest flow because it is under the highest pressure. The water at the bottom has more weight pressing down on it. This theory also explains why the current in a stream or river is stronger at the bottom than on the surface.

3) Viscosity

The viscosity of the fluid measures how the fluid resists flow. A high viscous fluid will flow slowly, while a low viscosity fluid flows faster. The viscosity of a fluid is affected by the temperature of the fluid.

4) Density

The density of a fluid also affects its flow. Fluids that have more mass per unit volume are heavier, having more density. They require more energy to flow, which causes them to be more viscous, resisting flow. Thick and dense fluids flow slower than thin, less dense fluids. For example, honey is dense and thick, and flows slowly. Water is thin and less dense, causing it to flow quickly.

© Super Simple Sheets

Name: _____ 82

Curriculum Connection
C2.8

Questions Answer the questions below using evidence from the text.

1) What does fluid flow mean?

2) Why is the current in a river or stream stronger on the bottom than on the surface?

PREVIEW

Explain How do [illegible] the flow of fluids?

Temperature	
Pressure	
Viscosity	
Density	

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

1) The denser a fluid, the faster it will flow.	True	False
2) The flow of fluids is caused by unbalanced forces.	True	False
3) Gravity pulls the water in a river downhill.	True	False
4) A liquid usually gets thicker when it is heated.	True	False
5) Temperature affects the viscosity and density of a fluid.	True	False

© Super Simple Sheets

Name: _____ 83

Curriculum Connection
C2.10

Circulatory System

What is the Circulatory System?
The circulatory system is the movement of blood through the body. Blood is a fluid that carries nutrients to the cells in our body to feed them and help them fight disease. Therefore, the **circulatory system's** main job is to regulate the flow of blood through our bodies so it can deliver essential nutrients.

Meet the T... - Organs in the Circulatory System
The main ... in the circulatory system are blood vessels and the heart. There are three typ... ...essels: arteries, veins, and capillaries.

1) ... ...ted blood away from the heart to the rest of the body. You ca... ...memb... ...calling "A is for 'artery' and 'away' (from the heart).
2) Veins car... ...ple... ...lood back to the heart
3) Capillaries ... ...blood ... ...at connect arteries to veins



... ... oxy... ...r blood. The cells in our body need oxyge... ...arvi... ...way they get oxygen is from the heart pumping ... ...ted ... ...xygen to them.

The hea... ... this b... ...blood through the lungs, where oxygen is put into ... ...lood. ...xygen rich blood is sent away from the he... ...arte... ...he cells in our bodies use the oxygen, t... ...s ... ...k by veins to the heart and lungs so it can ... ...r oxyge... ...s entire process takes about 1-2 minutes ... ...od ... ...through your entire body!

PREVIEW

The Heart
Your heart is a muscle that acts like 2 pumps. On the right side of your ..., used blood from the body is received and pumped to the lungs to get oxygen. On the left side, the heart receives blood from the lungs and pumps it to the body.

The heart is a complex organ. Learn more about the parts of the heart below.

Atrium	Upper chamber where blood enters the ventricles of the heart
Ventricle	One of two large chambers towards the bottom of the heart
Aorta	Major blood vessel that carries blood away from the heart
Tricuspid Valve	On the right side and separates the upper and lower chambers
Pulmonary Veins	Carries oxygenated blood from lungs to the heart (2 on each side)
Pulmonary Artery	Carries used blood from the heart to the lungs

© Super Simple Sheets

Name: _____ 84

Curriculum Connection
C2.10

Definitions

What do the blood vessels below do?

Blood Vessels	Function – What do the Blood Vessels do?
Arteries	
Veins	
Capil	

PREVIEW

Diagram

Lab ram below using the terms in the word bank.



Word Bank
- Pulmonary vein
- Pulmonary artery
- Tricuspid valve
- Right atrium
- Left atrium
- Right ventricle
- ventricle
-

Questions

Use information from the text to support your a

1. What is the main job of the heart?

2. How do the lungs and heart work together to get oxygen to our cells?

© Super Simple Sheets

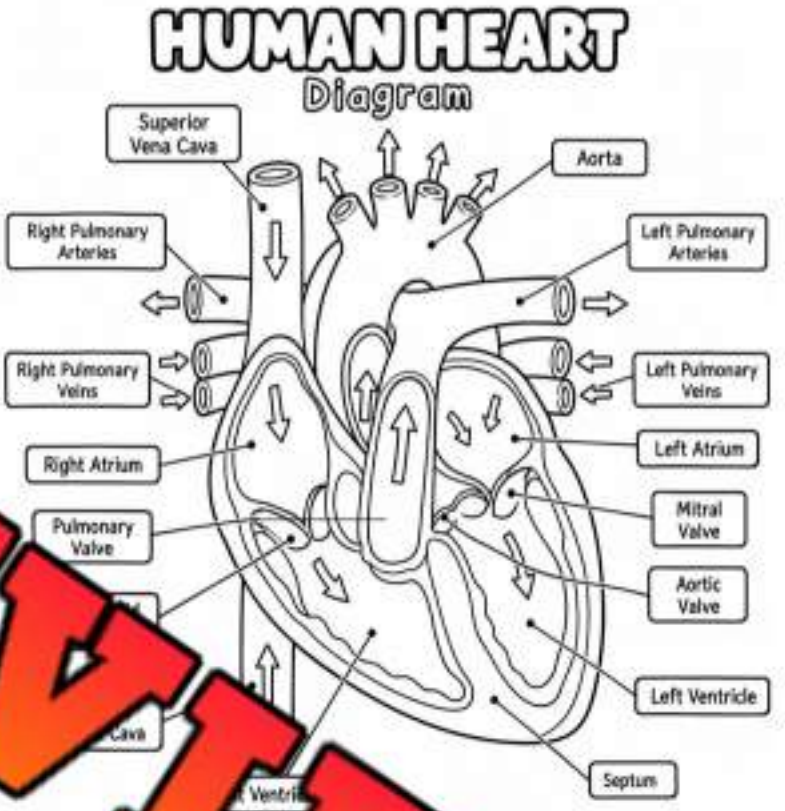
Name: _____ 86

Curriculum Connection
C2.10

Regulating Fluid in the Circulatory System

The Heart

The heart is a muscle that pumps blood throughout the circulatory system. The heart is divided into two separate pumping systems, the right side and the left side.



- The ri… receives oxyg… d from your v… oxygen, so … pumpe… gs where it be… hat… and where … of ca… dioxide.
- The left side of your … receives the oxygen-rich … ro… your lungs. It pumps it through yo… arteries to the rest of your body.

PREVIEW

Regulating Blood Flow - Valves

Blood flows through your heart and lungs in fo… ps:
1) The right atrium receives the oxygen-poor blood … body a… mps it to the right ventricle through the tricuspid valve. The **tricuspi**… …pen… …clos… to ensure that blood flows in the correct direction. The valve … esig… …t no blood flows backwards between these two chambers. It opens … heartbeat, allowing blood to continue to flow.

2) The right ventricle pumps the oxygen-poor blood to the lungs through the pulmonary valve. The **pulmonary valve** regulates the flow of the oxygen-poor blood into the lungs, so that it can become oxygenated.

3) The left atrium receives the oxygen-rich blood from the lungs. It pumps the blood through the **mitral valve** where it ends up in the left ventricle.

4) The left ventricle pumps the oxygen-rich blood through the **aortic valve** where it is then sent in multiple directions through the body.

The heart is pumping with every beat, usually around 50+ a minute. These valves work to ensure that the flowing blood does not flow backwards. There is only one direction for the blood to flow in a functioning heart and that is because of our heart valves.

© Super Simple Sheets

Name: _____ 87

Curriculum Connection
C2.10

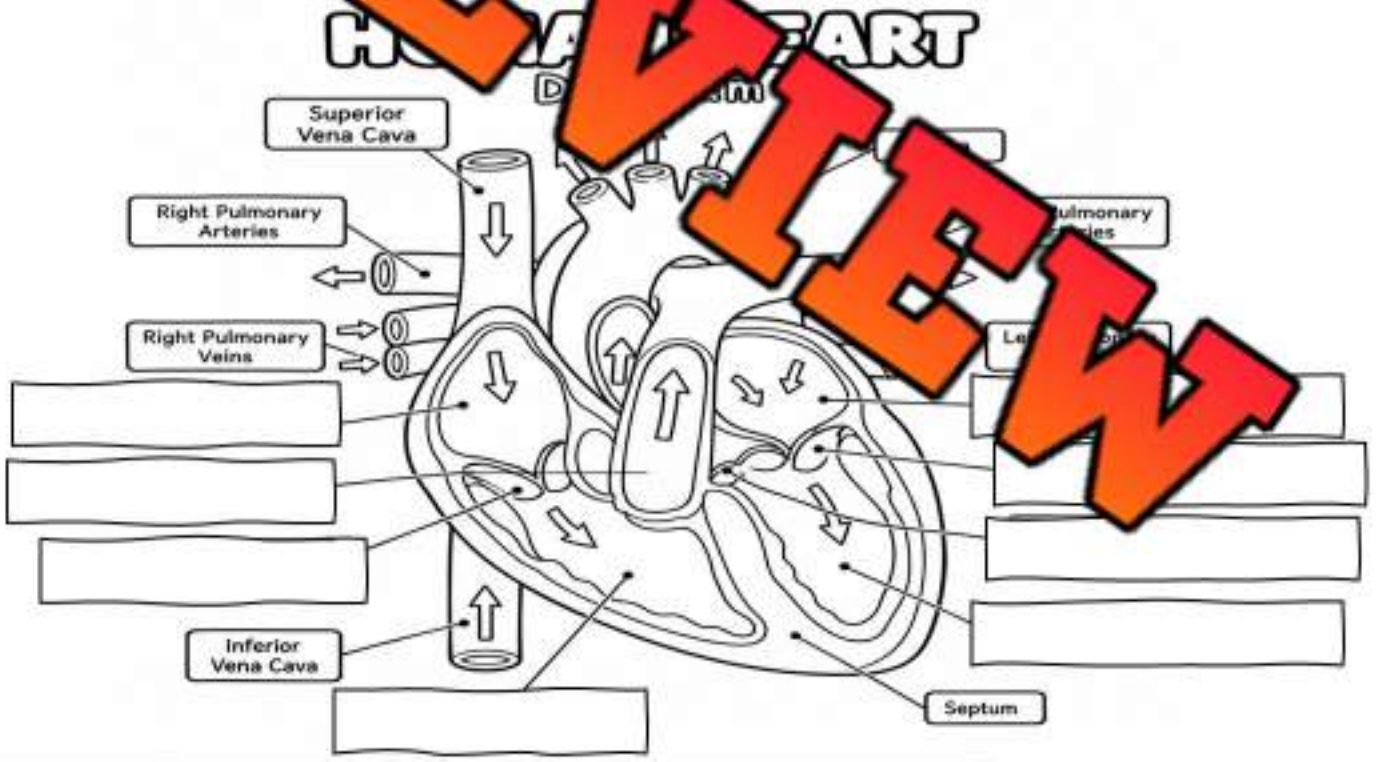
Questions Use information from the text to support your answer.

1) What is the function of our heart valves? Why do we need them?

2) What co[illegible]appen if our valves stopped functioning properly?

PREVIEW

Diagram Lab[illegible]filling in the missing labels.



Questioning Write 2 questions you have about the reading.

1)	
2)	

Name: _____ 90

Curriculum Connection
C2.10

Research – Fish's Bladder vs Ballast Water

Research Answer the questions below.



1) What is ballast water?

2) Why do cargo ships carry ballast water?

PREVIEW

3) Draw two diagrams of a ships that uses ballast water.

Cargo ship that is empty	Cargo ship that is full

© Super Simple Sheets

Curriculum Connection
C2.10

4) What is a fish's swim bladder? What does it do?

5) Dra[illegible]ee di[illegible]a fish that uses their swim bladder.

Fish floating up	Fish staying at the same depth	[illegible]

6) How is a fish's swim bladder similar to a ship's use of ballast water?

PREVIEW

© Super Simple Sheets

Name: _____ 94

Curriculum Connection
C1.2

Oil Spills

Oil Spills

Almost 14,000 oil spills are reported each year. Oil can be spilled in many ways. Oil tankers carrying large amounts of oil can spill oil in the oceans they travel in. From 2010-2020, approximately 164,000 tonnes of oil was lost from tanker spills.

Oil can also be spilled in pipelines. In 2021, the Keystone pipeline that carries oil from Alberta to North Dakota began to leak. Approximately 2 million litres of oil was spilled out of the underground pipes and onto farmland in North Dakota.

The Deepwater Horizon oil spill was the biggest marine spill in history. It was caused by an explosion on the Deepwater Horizon oil rig. The oil rig was working to extract oil 1,522 metres below sea level. The spill continued for [illegible] they could not control the leaking of oil. [illegible] litres of oil was pumped into the Gulf of Mexico.



Oil Spills – Impact on the Environment

When oil spills, the effects can last for years. Oil spills have numerous environmental consequences.

1) Death of Birds and Marine Mammals

Birds are the most likely to be covered by oil spills in the water. This is because oil floats on top of the water, and sea birds dive through the surface of the water to find their food. Even a small amount of oil can be deadly. If a bird's feathers are coated, they can no longer fly. The Exxon Valdez oil spill killed 250,000 seabirds.

Marine Mammals such as whales, dolphins, seals and otters are often killed by oil spills. Oil can clog the blowholes of whales and dolphins making it impossible for them to breathe. Otters and seals become coated by oil, which leaves them vulnerable to hypothermia.

2) Groundwater

When oil spills from pipelines underground, it pollutes our groundwater supply. The chemicals inside of oil end up leaching into the groundwater and soil, which affects the growth and development of plants and animals. These pollutants can cause cancers in humans as well when the polluted groundwater is consumed. This is why it is important to test well water often because it is taken directly from the groundwater. Water that a city provides is tested often.

Oil Spills – Impact on the Economy

When oil is spilled, it is very costly to cleanup. The Deepwater Horizon oil spill cost the BP oil company over $63 billion in legal fees and cleanup costs. If anyone or any company was affected by the spill, they had the right to sue BP and earn money as compensation. The government also pays when oil is spilled. In 2010, they sent the Louisiana National Guard to help assist local communities to remove the oil from critical habitats.

PREVIEW

Name: _____ 95

Curriculum Connection
C1.2

Questions

Use information from the text to support your answer.

1) What is an oil spill? How do they happen?

2) What h[illegible]with the Deepwater Horizon oil spill?

PREVIEW

Impacts

How do oil spills im[illegible]act t[illegible]nd the economy?

Environment	
Economy	

True or False

Is the statement true or false?

1) Oil spills from underground pipelines affect the groundwater and soil.	True	False
2) The Deepwater Horizon explosion happened in South Dakota.	True	False
3) The BP oil spill cost their company over $63 billion.	True	False
4) Sea birds are affected the most by oil spills as the oil sits on the surface.	True	False
5) Well water is automatically tested by cities.	True	False

© Super Simple Sheets

Name: _____ 97

Curriculum Connection
C1.2

Oil Spills Affecting Indigenous Groups

Indigenous Groups vs Oil Companies

Indigenous groups have fiercely opposed oil companies since their existence. Indigenous groups have a deep connection with the environment. When the environment is healthy, they feel healthy.

The extraction and distribution of oil is a messy job. It requires a lot of digging, leads to messy spills, and emits a great deal of air pollution.

Oil is often found in northern parts of Canada that Indigenous groups have treaty claims to. Even that is disputed, in many cases, Canada has granted oil companies permission to use the land to extract oil.

Oil Spills Affecting Indigenous Groups

When oil is distributed after extraction and processing, it is often sent through underground pipelines. When pipelines crack underground, they cause oil spills that seep into the groundwater and eventually on the Earth's surface.

In January 2019, 5,000 litres of oil was spilled in an Indigenous community in Saskatchewan. It took a long time as there were a lot of pipes underground, so officials did not know which company's pipeline had burst. It ended up being Tundra Energy's pipeline that burst.



The spill happened on the lands of Ocean Man First Nation. Ocean Man Chief Connie Big Eagle said the spill was 15 metres in diameter. A pond of oil was sitting on top of a low-lying area.

Ocean Man has 540 residents. A member began to smell the scent of oil a week before the oil spill was located. The member reported the smell to the government, but oil companies believed it was likely just oil rigs in the area that were creating the smell. If they had taken the first notification of a spill seriously, they may have prevented the spill in the first place.

The first reaction by the Ocean Man Chief was sadness because it was affecting the land. The First Nation was adamant that the oil company return Mother Earth back to the way it was. The oil company responded by shutting down their lines and were able to recover most of the oil within a few days of the discovery. The company believed that no lasting environmental impacts were made because the spill was isolated away from communities.

Oil spills continue to be problematic for Indigenous communities as their lands tend to be closer to pipelines and oil mines. In 2019, there were 81 long-term drinking water advisories affecting more than 50 Indigenous communities. These advisories were a result of oil spills polluting the groundwater.

PREVIEW

Name: _____ 98

Curriculum Connection
C1.2

Questions

Use information from the text to support your answer.

1) Why do Indigenous communities oppose oil companies? Why do they deal with them a lot?

2) What [illegible] oil spill in the Ocean Man community?

PREVIEW

Reaction

Do you think the Ocean M[illegible]munit[illegible] as much oil as Canadians in big cities? Why is this spill unfair to t[illegible]ean[illegible] community?

True or False

Is the statement true or false?

1) Indigenous communities use more oil than the rest of Canada.	True	False
2) Indigenous communities deal with more oil spills than the rest of Canada.	True	False
3) This spill could have been avoided if oil companies investigated earlier.	True	False
4) The oil spill was 10 metres in diameter.	True	False
5) Oil spills are causing drinking water advisories.	True	False

© Super Simple Sheets

Name: _____ 99

Curriculum Connection
C1.2

Research – Oil Spills in Indigenous Communities

Research one of the oil spills below that happened in Canada and that affected Indigenous communities.

- Husky Energy pipeline leak in 2016
- Nexen Energy's Long Lake oil spill in 2015
- Apache Canada pipeline leak in 2013
- Plains Midstream pipeline leak in 2012
- Pace [illegible]d Gas leak in 2012
- Rainb[illegible]ine owned by Plains Midstream cracks in 2011



Reseal [illegible] Answ[illegible]uestions below.

1) Which oil sp[illegible]d rese[illegible]?

2) How many litres were spilled?

3) What caused the spill? Was it in a pipeline? Explain.

PREVIEW

© Super Simple Sheets

4) What was the effect of the spill? Did it harm the environment? People? Indigenous communities? Explain.

5) Was the spill [illegible] up? [illegible] did the clean-up cost?

6) Were there any lawsuits after the spill? Did the company [illegible] pay for any damages? Explain.

PREVIEW

© Super Simple Sheets

Name: _____ 101

Curriculum Connection
A2.1, A2.2

Coding – Cleaning Oil Spills

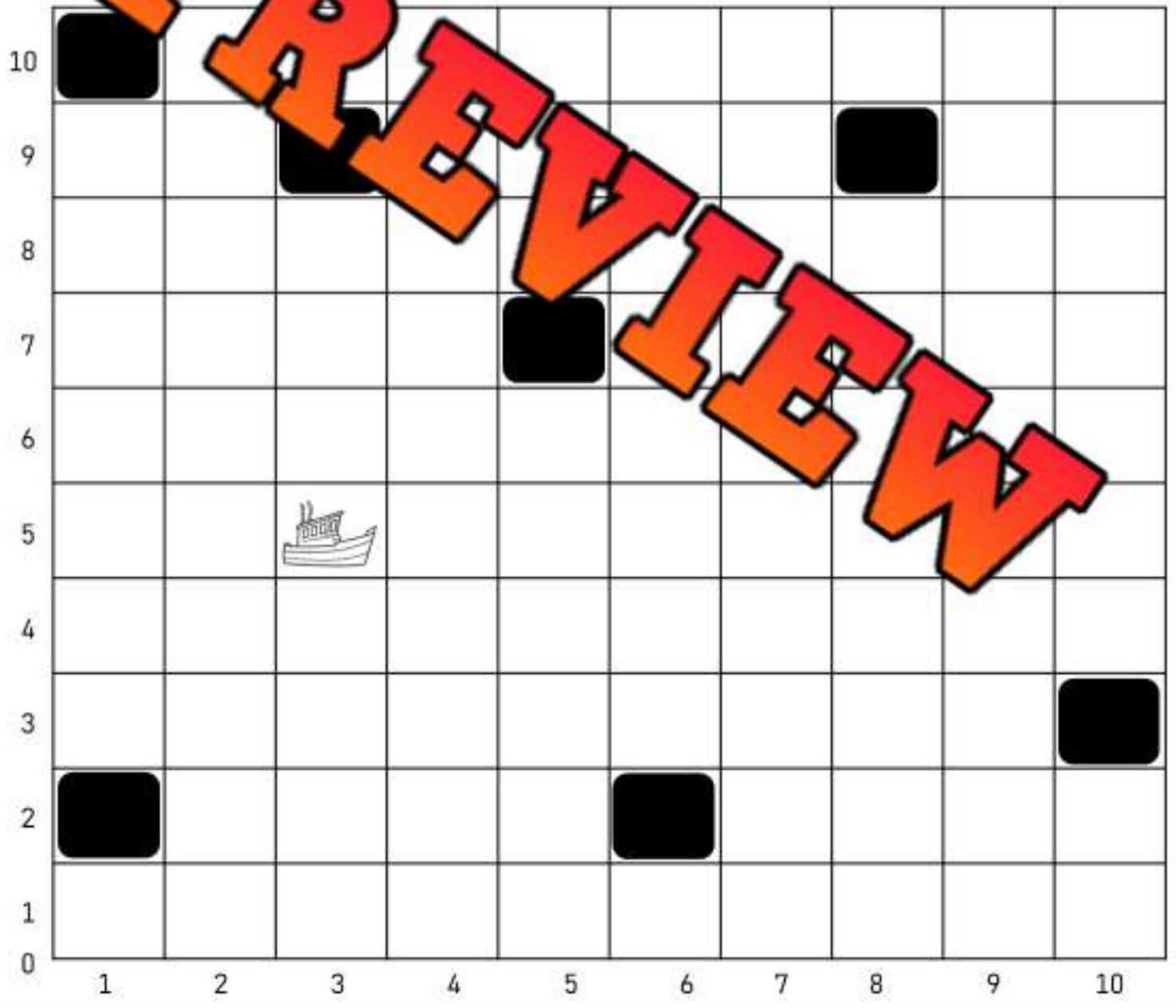
To clean an ocean oil spill, the following steps are performed.

1) Booms (floating barriers) are placed around the oil spill to trap the oil in one spot.
2) A skimmer is used to scoop up or absorb the oil.
3) Vacuums suck up the remaining oil.

Write a sub-program with the three steps above. Then program a boat to travel to the oil spill. Once you are there, run your sub-program to clean up the oil.

Mapping ... to write the code on the next page.

PREVIEW



Name: _____ 102

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

Code Write code below to clean up the oil spill in as few lines as possible.

1) Write your sub-program below with each step of cleaning up an oil spill.

2) Write code that explain[illegible] boat [illegible]t to the coordinates on the grid.
Check out the example bel[illegible]
move to (1, 2)
run sub-program (which you will name [illegible]ng el[illegible]

PREVIEW

Name: _____ 103

Curriculum Connection
A1.1, A3.1, A3.2, A3.3

STEM Assignment – Fluid Technology

Many technologies use the properties of fluids to work. For this assignment, you will be researching one of these technologies that use fluids. Your job will be to write down the steps the technology performs for it to work.

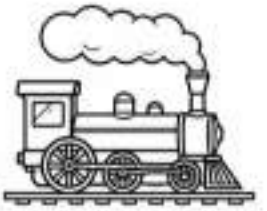
You will also write a coding program that allows your technology to run automatically, without the need for humans. You will program the technology using a sub-program as well as other blocks of code that allow the technology to work.

Some ideas for fluid technologies are listed below. Think of technologies that have clear steps on how they function.

- ✓ [illegible]sors
- ✓ [illegible]
- ✓ Steam [illegible]
- ✓ Water [illegible]
- ✓ Hydr[illegible]
- ✓ Vacuum







PREVIEW

Research Answer the [illegible] be[illegible]

1) Which technology have you chosen?

2) How does your technology use fluids?

3) How does your technology work? Write approximately 3-5 steps the technology performs to do its function.

Name: _____ 104

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

Coding Write the code that allows your technology to work.

Write a subprogram below that shows the steps your technology uses to work. Next, write the remainder of the program that uses the sub-program to complete the job.



© Super Simple Sheets

Name: _____ 105

Curriculum Connection
A1.1, A3.1, A3.2, A3.3

Draw Draw a sketch of your technology. Label the important parts that allow it to work.



© Super Simple Sheets

Name: _____ 106

Curriculum Connection
A1.1, A3.2

STEM Math connection – answer the questions below.



1) If you were making this fluid technology, how much would it cost you to make?

2) How many units will you make at first?

3) H cost you in total?

4) How much will you sel for?

5) How much money will you gross (earn) if yo ,000 ross earnings, do not factor in the cost of each unit.

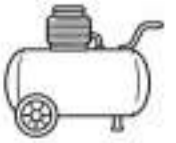
6) How much net profit will you earn if you sell 5,000 units? For net profit, you'll find the gross and subtract the cost to build the 5,000 units.

7) If you want to make $5 million in net profits, how many units will you need to sell?

PREVIEW

Name: _____ 107

Activities – Fluid Technologies



Word Search

Find the words from the word bank.

Gas	Air	Pressure	Compressibility	Density
Hydraulic	Pneumatic	Force	Multiplication	Factor
Pascal	Regulate	Flow	Spill	Technology

PREVIEW

Word Scramble

Unscramble the words from the word bank.



ETLUGERA		PSLEITSRCOIYMBI	
DESYTIN		NIALTTILUCPOIM	
ANECMTIPU		IRA	
RRPSUESE		SLLIP	
OCTFAR		IHDUCYARL	

© Super Simple Sheets

Name: _____ Date: _____

Unit Test - Fluids

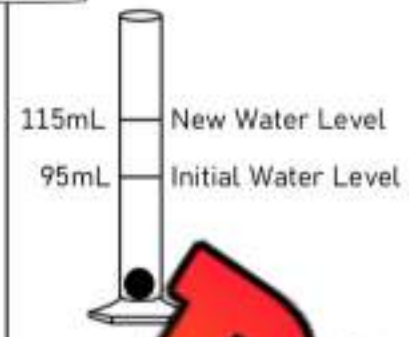
Multiple Choice /10

1) Which is a fluid? a) A liquid b) A solid c) A gas d) A liquid and gas	2) Which has the highest viscosity? a) Water b) Oil c) Ketchup d) Milk
3) Particles are a) Close together b) Far apart c) Not moving d) None of the above	4) The density will be higher if the mass is high, and the volume is... a) Small b) Medium c) Large d) All of the above
5) Which state of matter has the least density? a) A liquid b) A solid c) A gas d) Both a and C	6) Which state of matter is easiest to compress? a) A liquid b) A solid c) A gas d) None
7) If the mass of an object is 200 g and the volume is 25 cm^3, what is the density? a) 0.125 g/cm^3 b) 0.5 g/cm^3 c) 25/200 g/cm^3 d) 8 g/cm^3	8) If a liquid has a density of 1.2 g/cm^3, it will be... a) Positively buoyant b) Negatively buoyant c) Neutrally buoyant d) None of the above
9) If 10 kg of water is displaced when you put an object in water, what is the buoyant force? a) 10 kg b) 20 kg c) 5 kg d) 100 kg	10) When air is compressed, it gets... a) Warmer b) Colder c) Stays the same temperature d) None of the above

PREVIEW

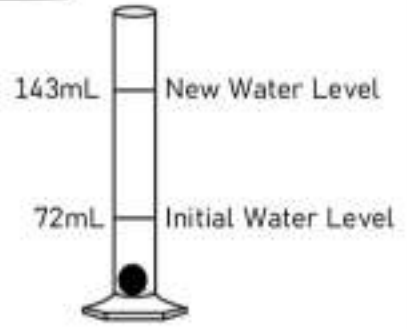
Calculate Fill in the tables below by reading the diagrams.

1)



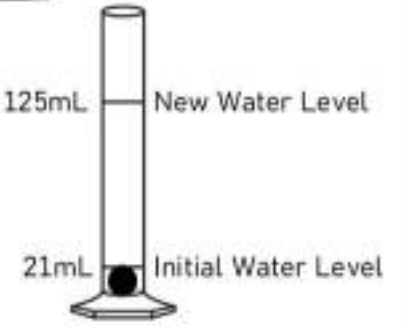
Vo	
Mass	
Density	

2)



Volume	
Mass	120 g

3)



Volume	
Mass	
Density	2 g/cm^3

PREVIEW

Short Answer Questions (2 h)

1) How does the density of a fluid affect sity?

2) Does an egg have more buoyancy in a glass of water or s ter? at is the case.

3) How does a valve work? How does it regulate flow of fluids? Give an example.

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

1) What is the difference between a hydraulic system and a pneumatic system? What are examples of both? How do they use fluids to perform work?

2) How have fluid spills affected the [illegible] communities? Give an example of a fluid spill and discuss how it affected [illegible] and the environment.

PREVIEW

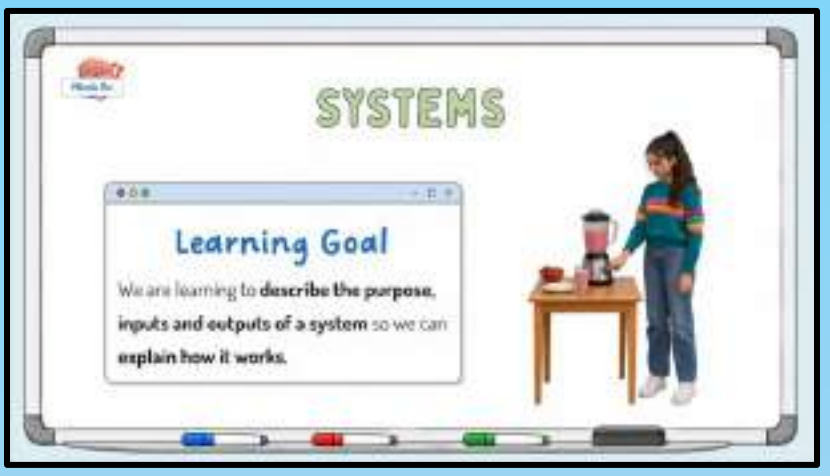
Google Slides Lessons Preview

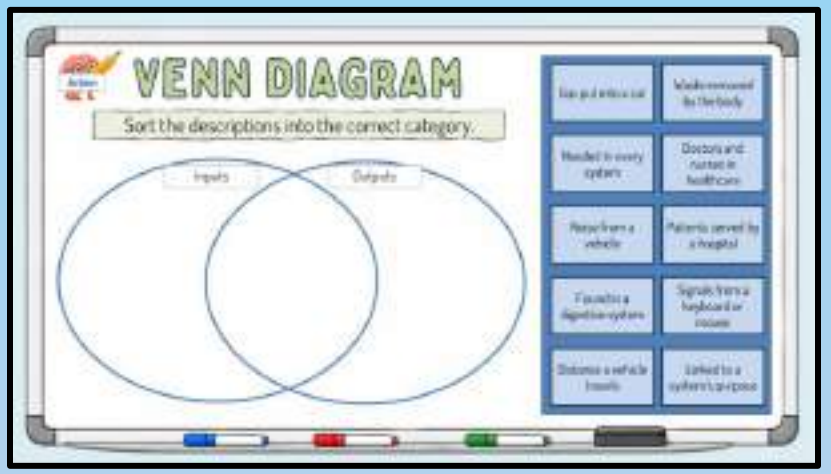
© Super Simple Sheets

Ontario Science Curriculum
Systems in Action– Grade 8

3-Part Lesson Format

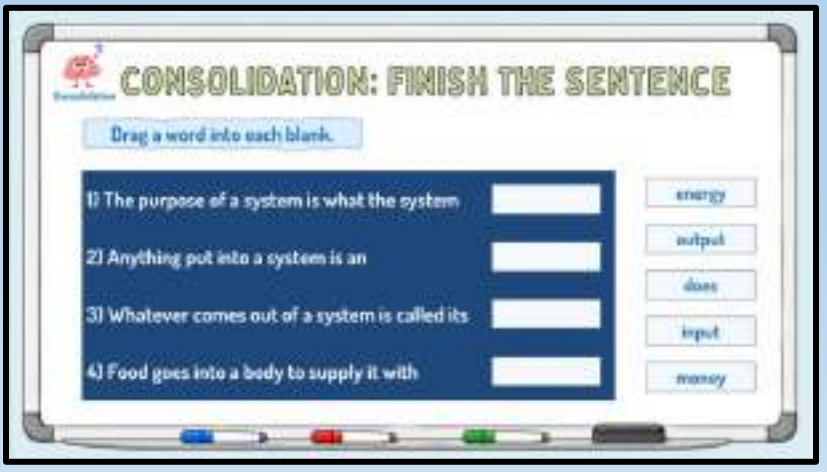
Part 1 – Minds On!
- Learning Goals
- Discussion Questions
- Quotes
- And More!



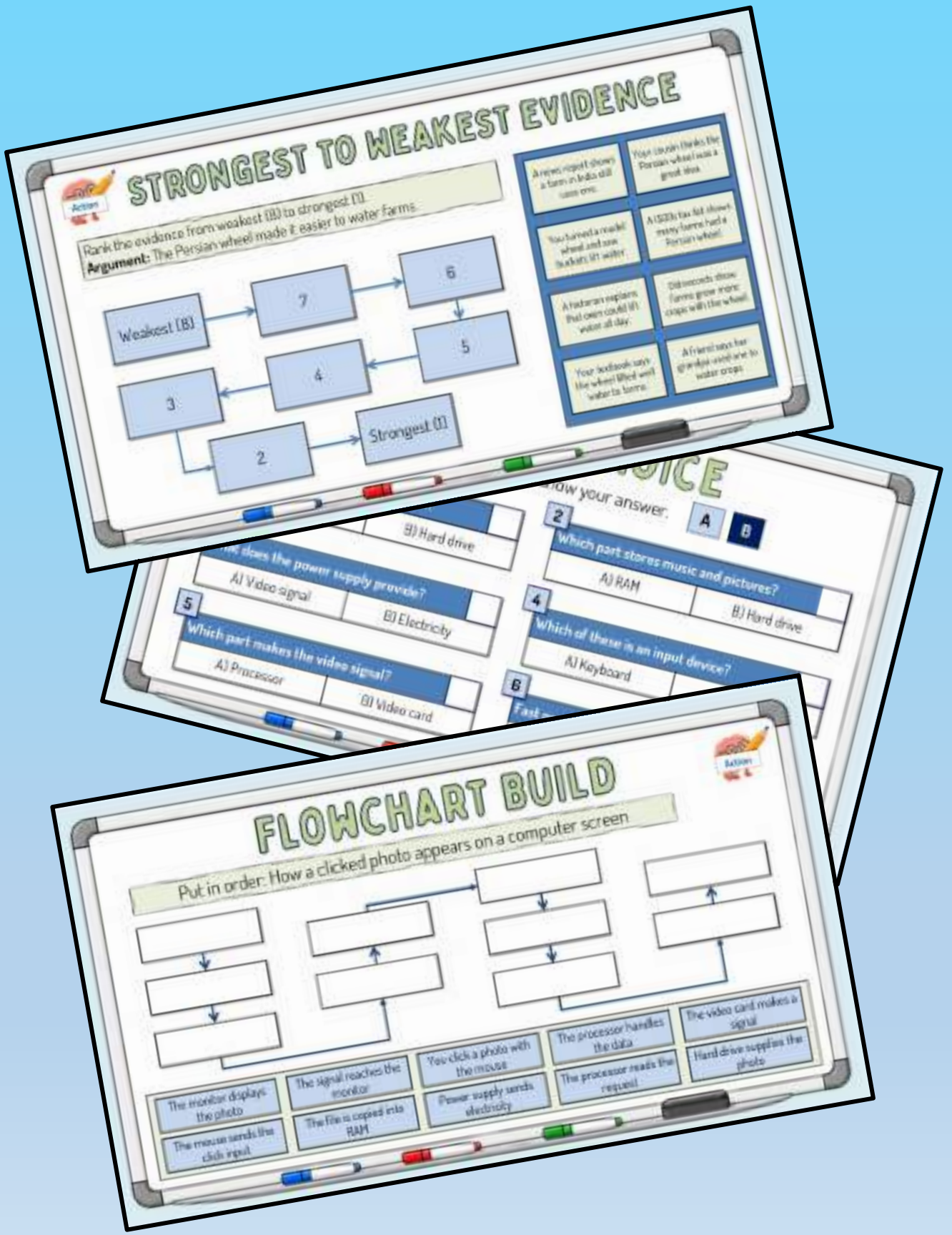


Part 2 – Action!
- Writing
- Matching
- Drag and Drop
- Drawing
- And More!

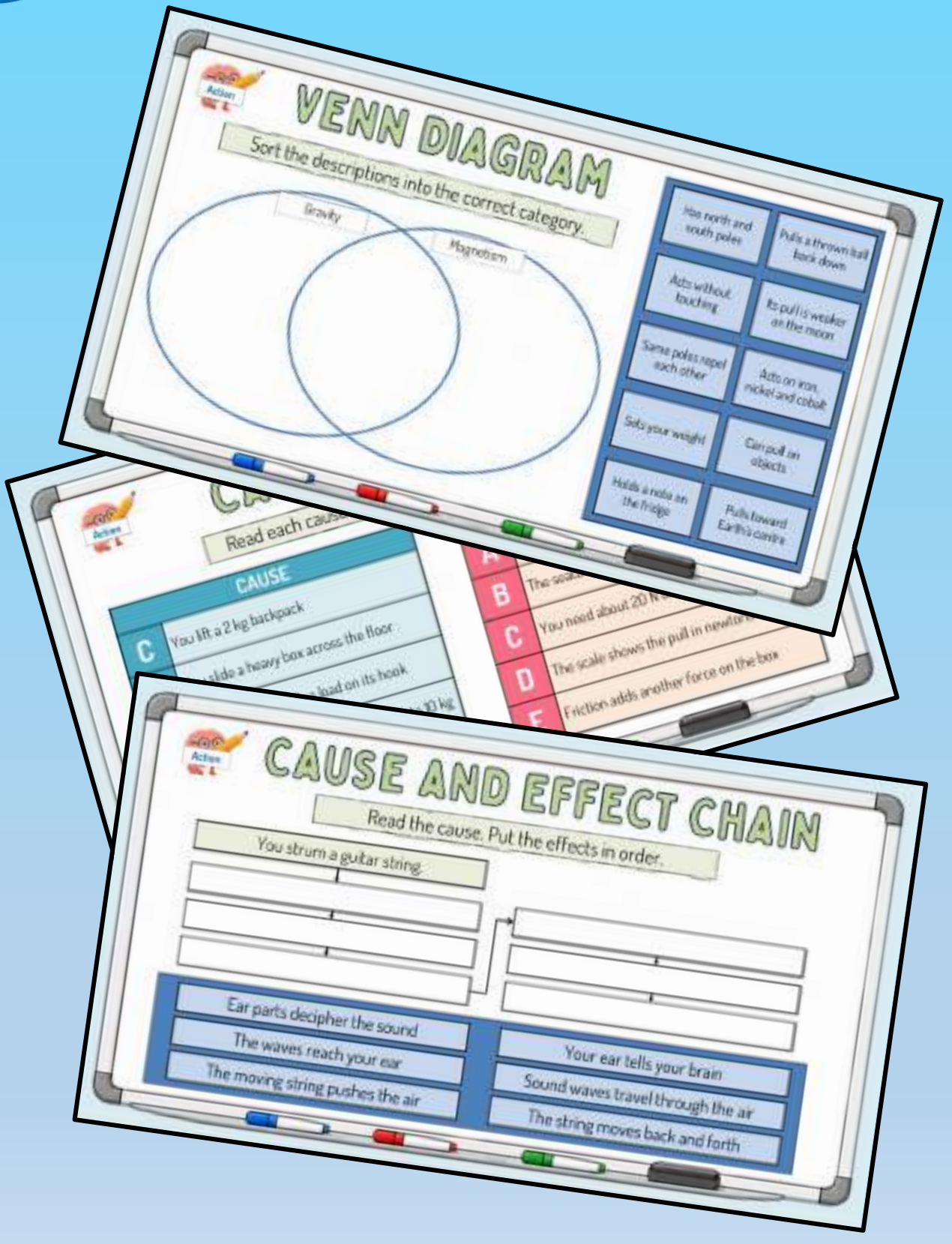
Part 3 – Consolidation!
- Exit Cards
- Quizzes
- Reflection
- And More!



Ontario Science Curriculum
Systems in Action– Grade 8



Ontario Science Curriculum
Systems in Action– Grade 8



Workbook Preview

© Super Simple Sheets

Grade 8 Science Unit

Systems in Action

D1 – Relating Science and Technology to Our Changing World
D2 – Exploring and Understanding Concepts

	Curriculum Expectations	Pages
D1.1	assess the social, economic, and environmental impacts of automating systems	93-102
D1.2	assess the impact on individuals, society, and the environment of alternative ways of meeting needs that are currently met by existing systems, taking different points of view into consideration	21-22, 102
D2.1	identify various types of systems	9-14
D2.2		14
D2.3		23-24
D2.4		69-74, 83
D2.5	work, force, and displacement in simple systems	42-45, 49-52
D2.6	explain the relationship between input and output forces and determine the mechanical advantage of various mechanical systems, including simple machines	53-60, 63-65
D2.7	identify ways in which energy can dissipate from mechanical systems, and describe technological innovations that make these systems more efficient	67-68, 75-77, 80-81, 86-87
D2.8	explain how providing information and support to consumers helps to ensure that the systems they use run safely and efficiently	69-74, 82-83, 88-92
D2.9	describe technological innovations involving mechanical systems that have increased productivity in various industries	93-102
D2.10	identify social factors that influence the evolution of a system	97-102

Preview of 80 pages from this product that contains 185 pages total.

© Super Simple Sheets

Grade 8 Science Unit

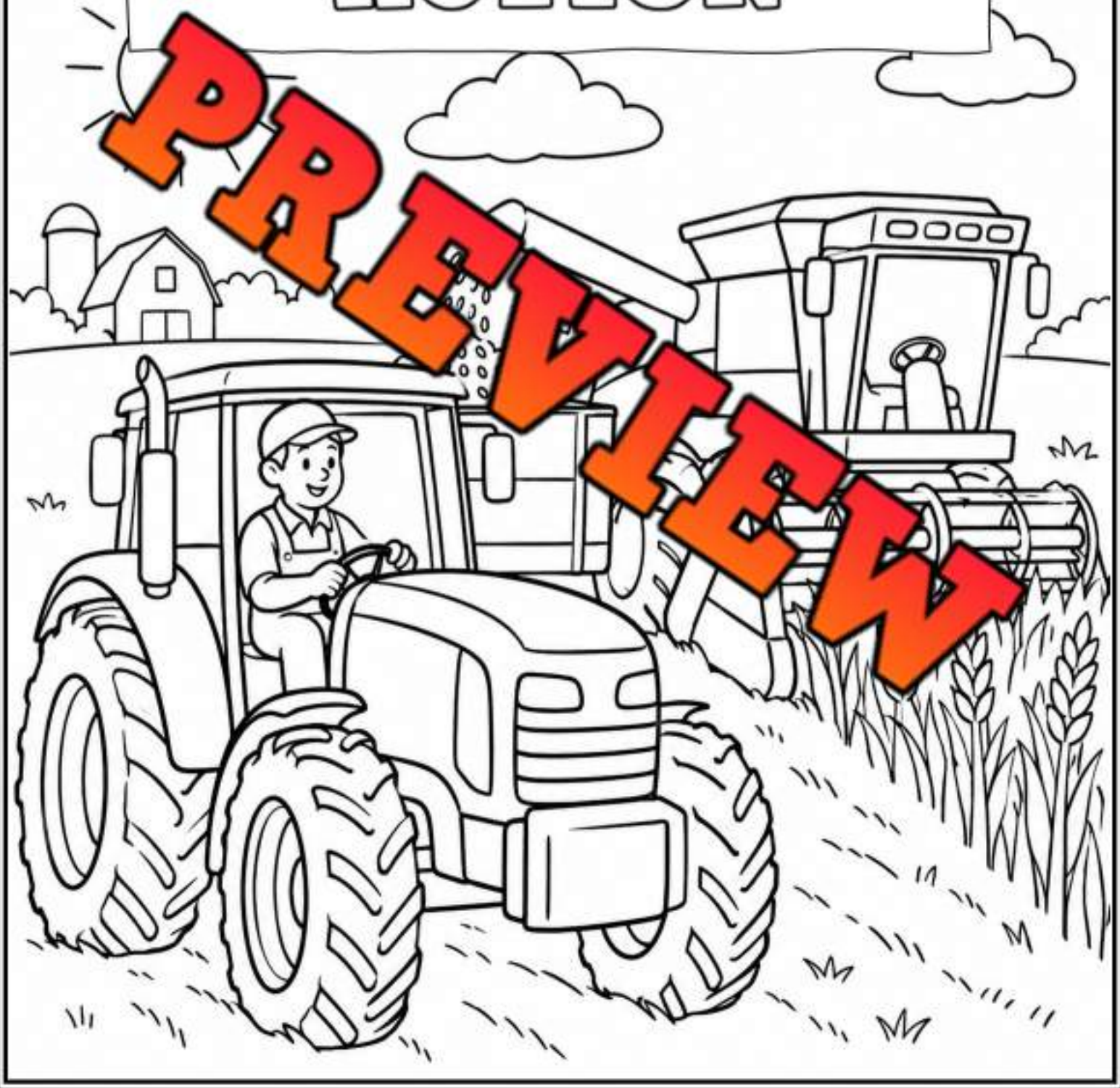
Strand A - STEM Investigation and Communication Skills

	Curriculum Expectations	Pages
A1.1	use a scientific research process and associated skills to conduct investigations	112-116
A1.2	use a scientific experimentation process and associated skills to conduct investigations	46-48, 78-79, 84-85
A1.3	use an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems	61-62
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	46-48, 61-62, 78-79, 84-85
A1.5	communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes	46-48, 61-62, 78-79, 84-85
A2.1	write and execute code in investigations and when modelling concepts, with a focus on automating large systems in action	103-111, 113-114
A2.2	identify and describe impacts of coding and of emerging technologies, such as artificial intelligence systems, on everyday life, including skilled trades	103-104, 109-111, 113-114
A3.1	describe practical applications of science and technology concepts in various occupations, including skilled trades, and how these applications address real-world problems	103-104, 112, 115
A3.2	investigate how science and technology can be used with other subject areas to address real-world problems	103-104, 112, 115-116
A3.3	analyse contributions to science and technology from various communities	103-104, 112, 115

© Super Simple Sheets

NAME: _____

SYSTEMS IN ACTION



PREVIEW

© Super Simple Sheets

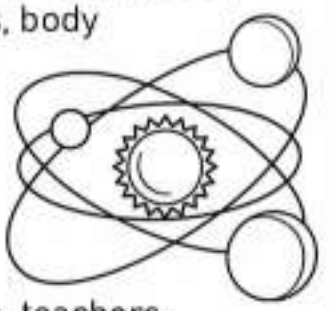
Name: _____ 9

Curriculum Connection
D2.1

What is a System?

What is a System?

A **system** is a collection of components that work together for a common purpose. There are systems everywhere in our lives. We have school systems, body systems, mechanical systems, political systems, health care systems, and many more. These systems are designed to serve a purpose and we are always trying to make these systems better.



Examples of Systems

School Systems

A school system has many different components, including students, teachers, educational assistants, administrators, schools, and so much more. The components in the school system work together, which allows the overall purpose of the system to be fulfilled.

The purpose of the school system is to help each individual student develop so they can navigate life and contribute to society when they are older. The school system is changing and evolving all the time, to get better at serving that purpose. For example, the Ontario math program now includes financial literacy as its importance is now understood in preparing students for life outside school.

Mechanical System

We also have **mechanical systems**, which are made of physical components that are organized together to serve a purpose. Examples of mechanical systems include heating and cooling systems, vehicles, computer systems, and bicycles.

A heating and cooling system has the purpose of providing heated air when it is cold, and cool air when it is hot so that we can be comfortable. The components of a heating and cooling system are often a furnace, air conditioner, thermostat, air handler, and condensing unit.

Body Systems

Our **body systems** are sets of organs and tissues that work together to serve a purpose. Our circulatory system is comprised of the heart, veins, arteries, and blood. Its purpose is to deliver oxygen and nutrients to cells throughout the body.



Other body systems include the skeletal system, muscular system, lymphatic system, respiratory system, nervous system and digestive system. These systems often work together and depend on each other in order to serve their purpose. For example, the circulatory system works with the respiratory system to deliver oxygen and remove carbon dioxide from the body.

PREVIEW

© Super Simple Sheets

Name: _____ 10

Curriculum Connection
D2.1

Questions

Use information from the text to support your answer.

1) What is a system? Are all systems perfect?

2) What is a technological system? What are some examples?

PREVIEW

Making Connections

Describe a system you know well – Ex. Minor hockey, cars, etc.

True or False

Circle whether the statement is true or false.

1) A computer is a system made of many computer parts.	True	False
2) My heart is a system with a lot of parts in it.	True	False
3) My heart is one part of my circulatory system.	True	False
4) My education is provided by the school system.	True	False
5) The justice system has police officers, lawyers, judges to keep us safe.	True	False

© Super Simple Sheets

Name: _____ 17

Curriculum Connection
D2.3

Research – HVAC System

HVAC stands for heating, ventilation, and air conditioning. HVAC systems supply homes and businesses with the ability to control the temperature, humidity, and purity of their air. The purpose of an HVAC system is to provide comfortable temperatures and acceptable air quality.



Research Learn about the components of an HVAC system.

PREVIEW

1) What [illegible] components of an HVAC system?

2) Write each component [illegible] column. [illegible] hat each component's function is in the right column.

Component	Function – What It Does

3) What is the process of the system? How does it work? Use the names of the components to describe the process.

4) What makes an HVA[illegible] What makes it inefficient?

5) Draw a diagram of an HVAC system. Label the component[illegible] the

PREVIEW

© Super Simple Sheets

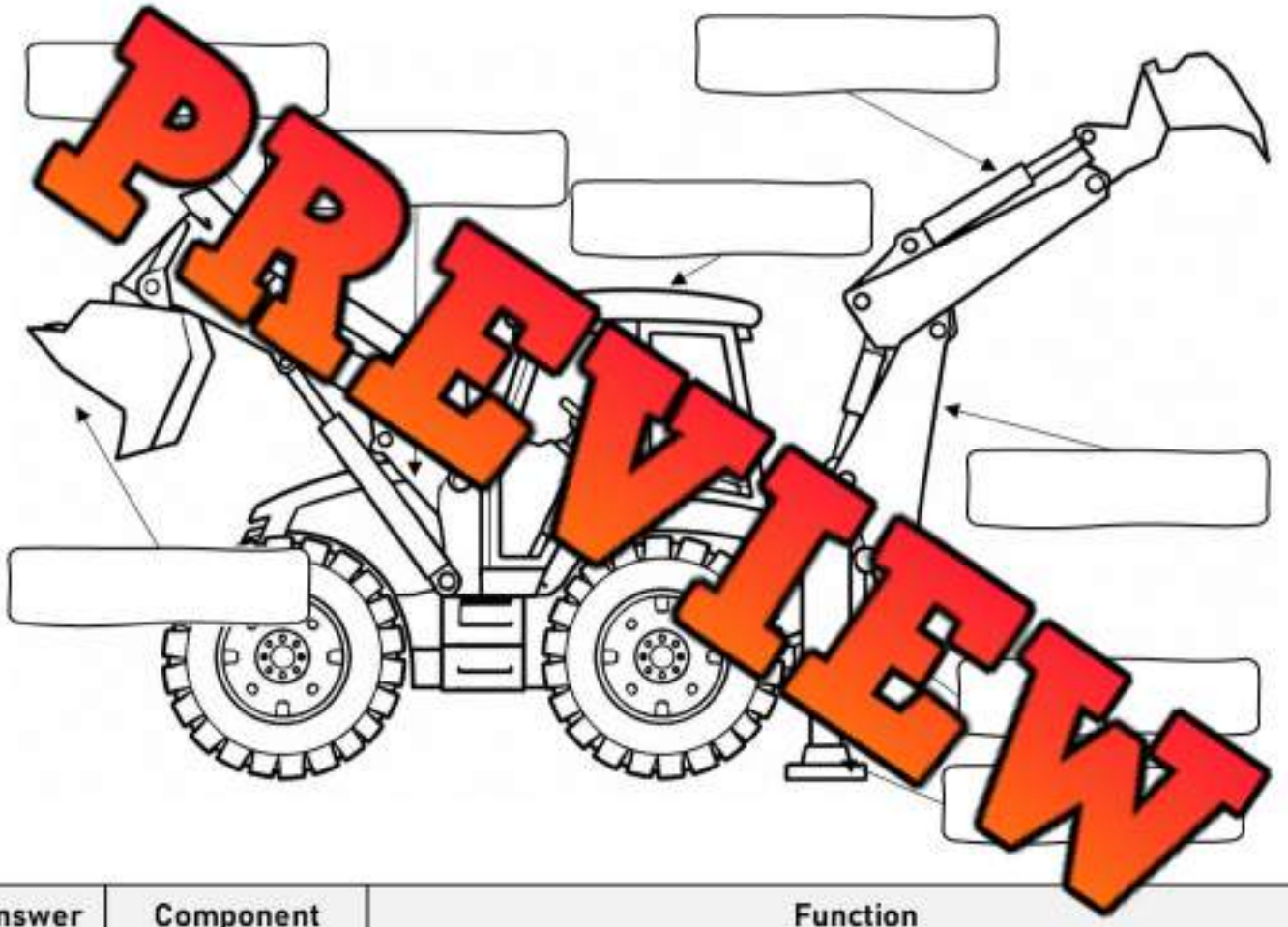
Name: _____ 19

Curriculum Connection
D2.3

Components of a Backhoe

Diagram Label the diagram of the backhoe using the components from the word bank.

Stabilizer	Swing Tower	Boom	Engine
Linkage	Bucket Loader	Hydraulics	Cab Enclosure



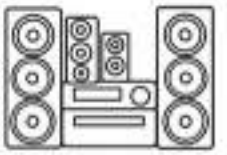
PREVIEW

Answer	Component	Function
	Stabilizer	a) Creates power for the backhoe
	Swing Tower	b) Long arm that is used to move and lift the bucket
	Boom	c) Allows the front bucket to move up and down
	Engine	d) Gives the backhoe more support preventing it from flipping
	Linkage	e) Provides even more power to the front and back buckets
	Bucket Loader	f) Allows the backhoe to turn
	Hydraulics	g) Protects the driver from weather or falling debris
	Cab Enclosure	h) Used to scoop up materials and hold them to be dumped

© Super Simple Sheets

Name: _____ 25

Activities - Systems



Word Search

Find the words from the word bank.

System	Purpose	Input	Output	Needs
Components	Function	Processes	Industry	Manufacturing
Politi	Environment	Social	Economy	Productivity

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

PREVIEW

Word Scramble

Unscramble the words from the word bank.

AISCLO		UTNPI	
PTUUOT		URNDYSIT	
NCAMUUAFRNGTI		ETPNSMONOC	
OCTIFNNU		SETYMS	
PSOPEUR		TNINNMEOREV	

© Super Simple Sheets

Name: _____ 28

Curriculum Connection
D2.4

Types of Energy

Types of Energy

There are many forms of energy in the world. Here are some examples of the main forms of energy we see.



Chemical Energy

Chemical energy is stored in matter. **Matter** is everything around us that has m[illegible]nd takes up space. Therefore chemical energy is stored in things l[illegible] batteries, and gasoline. Chemical energy can produce thermal [illegible]. Wood contains chemical energy that is stored in the wood. Whe[illegible] the chemical energy that was stored in the wood turns into therm[illegible]ergy a[illegible]

Electrical Ene[illegible]

Electrical energy [illegible]es e[illegible]chines to work. When we plug in our favourite electronic, t[illegible] pl[illegible]rovides electrical energy. Electrical energy comes from othe[illegible]of e[illegible] the burning of fuels or the energy from natural resources like [illegible]dan[illegible]er. Thermal energy is often released when electrical energy is us[illegible]abo[illegible]a TV gets hot or how a cell phone will heat up after being used f[illegible]ng tim[illegible]

Thermal Energy

Thermal energy is energy that is moved betwee[illegible]o[illegible]m hotter than the other. Thermal energy actually creates wind as [illegible]ment [illegible] from warmer areas to cooler areas causes wind. This energy [illegible]ha[illegible]ind turbines. The sun's thermal energy produces these winds.



Mechanical Energy

Mechanical energy is the energy that is possess[illegible] by an object due to its motion or position. Wind turbines are a form of mechanical energy because they move or will move when the wind acts on it. A drawn bow and arrow has mechanical energy in the form of elastic potential energy.

Nuclear Energy

Nuclear energy comes from splitting atoms in a reactor. **Atoms** are the smallest unit of matter. All solids, liquids, and gases are composed of atoms.

There is potential energy inside of atoms that can be used to heat water into steam, which can turn a turbine. This allows electricity to be made. Nuclear fission is the process of splitting atoms resulting in the release of energy.

PREVIEW

Name: _____ 29

Curriculum Connection
D2.4

Questions

Use information from the text to support your answer.

1) What is chemical energy? When have you used chemical energy?

2) What is [illegible] energy?

PREVIEW

Questioning

Write 3 questions you [illegible] reading.

1)	
2)	
3)	

Type of Energy

What are the types of energy below?

1. Energy that is stored in atoms	Electrical	Nuclear
2. When energy moves from one object to another	Heat	Chemical
3. Using a portable battery in my phone	Chemical	Mechanical
4. Solar energy from a solar panel on someone's roof	Mechanical	Electrical
5. Plugging in my T.V. to a wall outlet	Mechanical	Electrical

© Super Simple Sheets

Name: _____ 32

Curriculum Connection
D2.4

Non-Contact Forces

What Are Forces?

Forces are a push or a pull that causes the movement of an object. Forces can be non-contact or contact forces. A **non-contact** force acts on an object without touching it. Examples of non-contact forces are gravitational force, electrostatic force, and magnetic force.

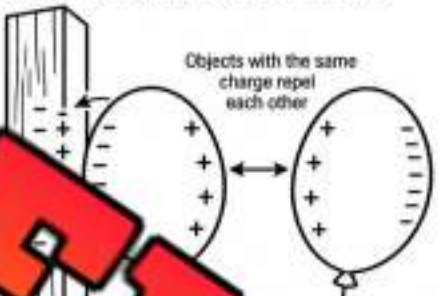
Gravitational Force

Gravity is a non-contact force that attracts matter towards the centre of the earth. Without gravity holding us, we would fall right off the Earth's surface and float away! Gravity is the reason why when you throw a ball into the air, it comes back down. When you throw a ball, you are applying a pushing force by pushing it into the air. Gravity's force is stronger than yours, which means the ball will come back down instead of going into the sky.

Our weight depends on gravity. Weight is the measurement of the force of gravity pulling us down. The reason we weigh how hard gravity is pulling us towards the Earth's surface. On other planets or the moon, we weigh a different amount because their gravitational pull is stronger or weaker.

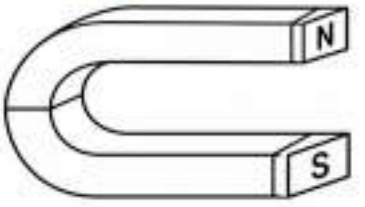
Electrostatic Force

Electrostatic forces are the attractive or repulsive forces between two electrically charged objects. When electrical charges move from one object to another, they produce static electricity.



Picture this, you rub your hair against a balloon. The negative charges in your hair move to the balloon causing more negative charges in the balloon. The extra negative charges on the balloon create what is called a buildup of negative charges. You can't see the extra negative charges but try bringing that balloon near a wall. The negative charges in the balloon will become attracted to the positive charges in the wall and they will stick together.

Magnetism



You've seen magnets and how helpful they can be. We use them for many purposes, including sticking things on our fridge. They work because of magnetism. **Magnetism** is an invisible force or field that either pushes or pulls certain objects.

A magnet is an object that is affected by the magnetic field. Magnets have a north and a south pole. You can attach two magnets by putting opposite poles together, but if you try to put the same poles together, they will repel each other.

Magnetism is a force because it pulls and pushes objects if they are made of a magnetic material. Magnetic materials are metals made from iron, nickel, cobalt and many more.

PREVIEW

Name: _____ 33

Curriculum Connection
D2.4

Questions
Use information from the text to support your answer.

1) What is a non-contact force? What are some examples?

2) What is [illegible]atic force? How is a balloon sticking to a wall an example?

PREVIEW

Making Connections
When h[illegible]e yo[illegible]ch of the non-contact forces?

Gravity	
Electrostatic	
Magnetism	

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

1) Gravity works because particles in matter either attract or repel.	True	False
2) A balloon will stick to a wall because they have the same charge.	True	False
3) Magnetism is a force that can either attract or repel two magnetic materials.	True	False
4) A compass works because of magnetism.	True	False
5) When a wool sweater sticks to your skin, it is because of gravity.	True	False

© Super Simple Sheets

Name: _____ 35

Curriculum Connection
D2.4

Research – How a Compass Works

The compass was invented a long time ago, to help sailors navigate their travels on oceans. Learn more about how a compass works by researching it below.



Research Answer the questions below.

1) What y[illegible]e compass invented?

2) Was GPS use[illegible]tim[illegible]eriod? Why was the compass so important?

3) Which non-contact force is used for this technology?

4) How does a compass work?

PREVIEW

© Super Simple Sheets

Name: _____ 36

Curriculum Connection
D2.4

5) Draw a diagram of a compass. Show where the north and south magnetic poles are located on the Earth in relation to the compass.

PREVIEW

6) Is the Earth's magnetic north pole at its geographic no... Ex...

7) Have you ever used a compass? If so, explain. If not, when would one be useful?

© Super Simple Sheets

Name: _____ 37

Curriculum Connection
D2.4

Examples of Non-Contact Forces

Examine Describe the non-contact forces at work in the pictures below.

1)



2)



3)



4)



PREVIEW

© Super Simple Sheets

Name: _____ 38

Curriculum Connection
D2.4

Contact Forces

What are Contact Forces?

A **contact force** is any force that needs contact between objects. For example, kicking a soccer ball is a contact force because the force moving the soccer ball needed contact between the force and the soccer ball. The leg kicking the ball created the contact force, which performed work by moving the soccer ball.

Types of Contact Forces

- Friction Force

The force [illegible] by the surfaces of objects that move across each other. Friction usually opposes [illegible] of an object sliding across another object. Friction is important, as it allow[illegible]ound without slipping. Some materials have surfaces that creat[illegible]er, which is why shoes have rubber soles on the bottom.

- Tension Force

The force that [illegible]ed th[illegible]tring, rope, or wire when [illegible]ulled [illegible]es acting on opposite sid[illegible] directed over the length o[illegible] and [illegible] pulls equally on the objects a[illegible]nds. Suspension bridges use wires to [illegible]eate tension forces that spread the forces a[illegible] on the bridge equally throughout the bridge, allowi[illegible]o s[illegible]larger forces.



- Normal Force

A normal force is the everyday force that is felt wh[illegible]a[illegible]u[illegible]rd against an object that is placed on that surface. For example, a w[illegible]th[illegible]resti[illegible]table is being supported by the stable table, which is exerting an u[illegible]orc[illegible]ttle in order to support its downward gravitational force.

- Air Resistance Force – Drag Force

Air resistance is the force that is caused by air acting in the opposite dire[illegible]d an object moving through it. For example, a large truck will experience more air resi[illegible]ance forces than a sports car with a streamlined shape.

- Applied Force

An applied force is the force that is the result of the interaction between two or more objects. Examples include a person lifting a box or rotating a doorknob. Applied forces are the forces we use everyday to move objects.



- Spring Force

A spring force is the force exerted by a compressed or stretched spring upon any object that is attached to it. The compressed spring has potential energy in it that exerts a force on anything struck by its movement. Examples include a pogo stick, trampoline, or keys on a keyboard.

PREVIEW

Name: _____ 39

Curriculum Connection
D2.4

Definitions

What do each of the contact forces mean?

Applied	
Tension	
Air Resistan	
Norm	
Frictional	

PREVIEW

Making Connections

W[illegible]act for[illegible]you use often? Give at least 2 examples.

Matching

Match the example with the force at work.

Answer	Force	Example
	Applied	a) They subtract time from Ben's 100m race because of this force.
	Tension	b) A boat is secured to a dock with ropes.
	Air Resistance	c) There is less of this force when walking on ice.
	Normal	d) Angela pulls her suitcase to her hotel.
	Frictional	e) The computer rests on the desk.

© Super Simple Sheets

Name: _____ 40

Curriculum Connection
D2.4

Examples of Contact Forces

Examine Describe the contact forces at work in the pictures below.

1)



2)



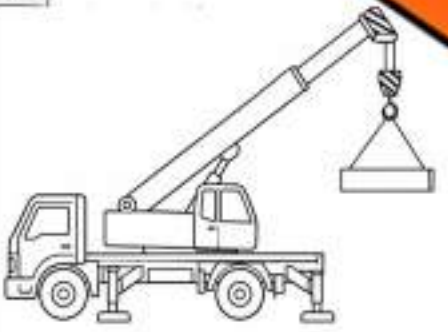
3)



4)



5)





PREVIEW

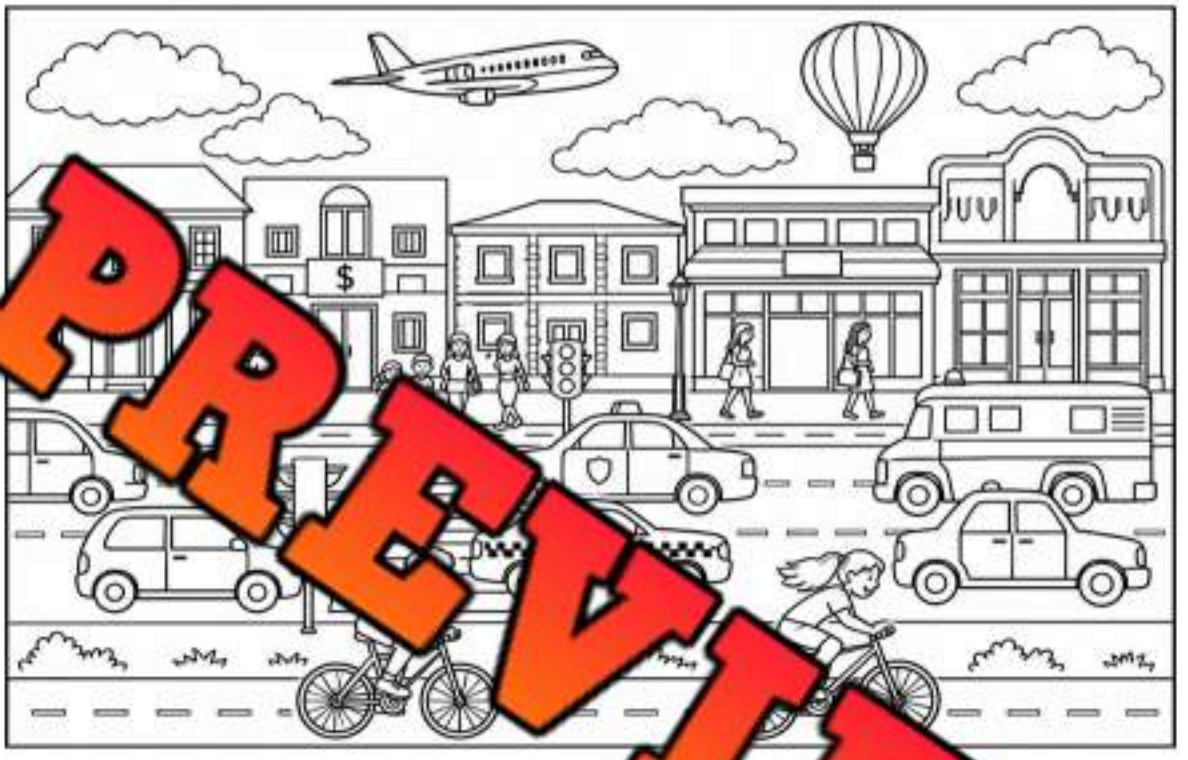
© Super Simple Sheets

Name: _____ 41

Curriculum Connection
D2.4

Physics – Describing Using Scientific Terms

Examine What examples of the terms below do you see in the picture?



PREVIEW

Energy (Kinetic/Potential, Mecha

Work – What work is being done in the picture?

Forces – What Contact and Non-Contact forces at acting on the objects in the picture?

© Super Simple Sheets

Name: _____ 42

Curriculum Connection
D2.5

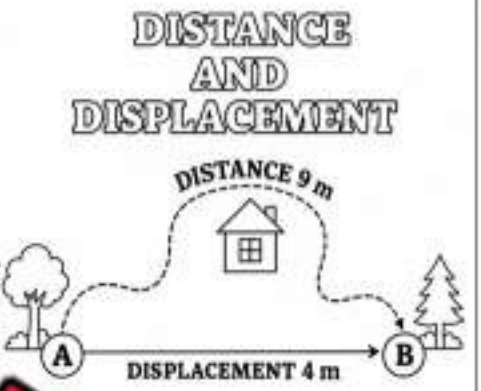
Describing Displacement

Displacement vs Distance

The terms displacement and distance are commonly confused terms in physics. Distance is what is known as a scalar quantity, while displacement is a vector quantity.

Scalar means the quantity can be fully described by a magnitude (numerical value) alone. For example, If you ran 5 km, the scalar value of the magnitude of your run would be 5 km. This is the distance you travelled, and it does not depend on any other vari

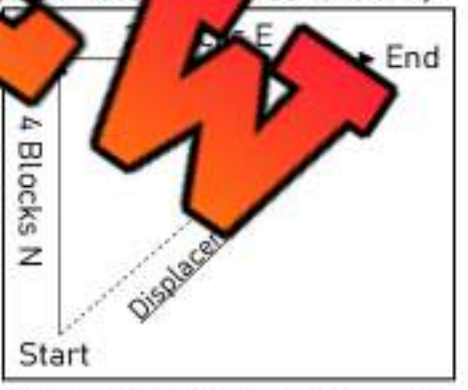
Vect s the quantity is fully described by both magnitude and direction. Both of t are needed to determine the vector quan vector quantity that tells us how fa of pla t is or the overall change in its position.



The 5 km vent o described using distance and displ nt. T 5 km, but the displacement is likely you likely did not run in a straight li an 5 ircle, your displacement is 0 km, becaus wa your position. If you ran 5 km to your f use, distance from where you started to yo nd's h is the displacement.

Examples of Displacement and Distance

- A track and field athlete runs 10 laps on a 400 r tota nce is 4 km, but their total displacement is 0 metres.
- Sydney runs four blocks north and three blocks east. The distance she ran is seven blocks total. This is a scalar quantity calculated by adding the values together. The total displacement is five blocks, which was calculated using the Pythagorean theorem, $4^2 + 3^2 = 25^2$ or 5 as 5 is the square root of 25^2.



- Emma drives 10 km north to a friends house to pick her up. They drive back to Emma's house and then drive 5km south to go to the mall. Emma's car has traveled a total distance of 25 km. Emma's car's total displacement is -5 km.

  The starting coordinates are Emma's house, at 0,0 on a coordinate plane. The reason she is -5 km away is because the frame of reference that was chosen to situate Emma's friends house at +10 km away. In other words, we could switch this to her friend's house being -10 km away, in which case her car's total displacement would be +5 km.

PREVIEW

Name: _____ 43

Curriculum Connection
D2.5

Scalar or Vector?

Are the quantities scalar or vector?

1) Roger biked 12 kilometres.	Scalar	Vector
2) Sam drove 75 kilometres north and 25 kilometres west.	Scalar	Vector
3) Courtney ran 800 m in 4 minutes.	Scalar	Vector
4) Cheryl boated 25 km north and then 25 km south.	Scalar	Vector
5) Stephan[illegible]rove 50 km south to work.	Scalar	Vector

Questio[illegible]

[illegible]ation from the text to support your answer.

1) What is the [illegible]we[illegible]alar and vector quantities?

2) When you tell someone how far you [illegible] are u[illegible]lking about distance or displacement? Explain.

PREVIEW

Calculate

Determine the total displacement and distance in the examples below.

Example	Distance	Displacement
1) 100 m north, 50 m south		
2) 500 km east, 300 km west		
3) 300 m north, 200 m south, 150 m north		
4) 1000 m west, 2 km east, 1500 m west		
5) 250 km north, 500 km south		

© Super Simple Sheets

Name: _____ 45

Curriculum Connection
D2.5

Calculating Displacement

Calculate Draw a diagram and calculate the displacement and distance.

1) 5 km north, 10 km south, 8 km north	
Distance	
Displacement	

2) 800 m west, 1200 m east, 300 m west	
Distance	
Displacement	

3) 125 m east, 480 m west, [illegible] east	
Distance	
Displacement	

4) 29 km south, 9 km south, 132 km north	
Distance	
Displacement	

PREVIEW

Question Calculate the distance and displacement.

Nicole drove 14 km west from her house to pick up her dinner. She then drove back home. Then she realized she forgot to get a drink, so she drove 7 km east to pick one up. When she got home, her friend asked to come over, so she drove another 18km west to get her before going back home. What distance did she drive when she got back home? What was her total displacement?

© Super Simple Sheets

Name: _____ 46

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

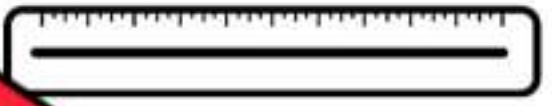
Experiment – Displacement vs Distance

Research Question What are we learning about?

What is the difference between displacement and distance? Today, you will complete two activities to reinforce the difference.

Materials What will you need for the experiment?

- ☐ [illegible]
- ☐ A [illegible] pass – [illegible]
- ☐ Tape





PREVIEW

Activity 1 Complete [illegible] the blanks.

1) Put a piece of tape on the gro[illegible] wh[illegible] walk outside.

2) Walk 10 steps forwards and stop. Us[illegible] metre[illegible] your partner measure approximately how many metres you walked. Yes[illegible] shou[illegible] this number to the nearest metre.

3) Now turn 180 degrees from where you ended and walk 5 [illegible] an[illegible] partner measure the distance you just walked (the 5 steps)

4) Now turn 180 degrees again and walk 20 steps and stop. Have your partner measure the distance you just walked.

5) Have your partner measure the distance from where you ended to where you started. This is your **measured displacement**.

6) Add up all of the measurements to find the actual distance you traveled.

© Super Simple Sheets

Name: _____ 47

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

Activity 1 Complete the steps and fill in the blanks.

7) Add all the forward measurements and subtract all backwards measurements to find the **calculated displacement**.

8) Why might your calculated displacement be different than your measured displacement?

Activity 2 Complete the steps and fill in the blanks.

1) Find your original piece of tape and stand on it.

2) Walk 10 steps north and measure the distance you walked.

3) Turn 90 degrees left (due west) and walk 15 steps and measure how far you walked.

4) Now turn 90 degrees left (due south) and take 10 steps and measure how far you walked.

5) Turn 90 degrees left again (due east) and talk 20 steps and measure how far you just walked.

6) Have your partner measure the distance from where you ended to where you started. This is your **measured displacement.**

7) Add up all of the measurements to find the actual distance you traveled.

PREVIEW

Name: _____ 48

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

Activity 2 Complete the steps and fill in the blanks.

8) Now figure out your calculated displacement and write it below. Use the graph below to sketch your path, using a point on the graph to represent the end point of each segment of the path. Use the graph to determine total displacement. (Be sure to include both magnitude and direction – N, S, E, or W, relative to the origin.)

*** 1 square on the graph is equal to 1 metre



PREVIEW

Calculated displacement	

Name: _____ 51

Curriculum Connection
D2.5

Calculating Work – Forces x Distance

We have learned that Newtons are the standard unit to measure forces. Work is the use of force to move an object. Therefore, for work to be done, it requires force and movement. We can calculate work by multiplying the force used in N by the distance in metres.

Work has its own unit of measurement called the joule (J). One J equals the amount of work that is done when 1 N of force moves an object over a distance of 1 m.



Example: [illegible]hes his lawn mower 100 metres. He uses 100 N of force to push the mow[illegible]he pushes with the same force the entire 100 m, we can deter[illegible]g this equation:

Work = 100 N x 100 m = 10 000 J

PREVIEW

Calculate [illegible] work[illegible] the questions below?

	Force Applied	D[illegible]	Work Done
1)	100 N		
2)	200 N	[illegible]m	
3)	500 N	1000 m	
4)	250 N	2 km	
5)	700 N	4.5 km	

Word Problems How much work is done in the questions below?

1)	Chris applies 300 N of force to push his stalled car 50 m. How much work did he do?
2)	Scott uses a force of 20 N to pick up a bag of groceries. He walks it 20 metres. How much work did he do?
3)	A horse pulls a wagon 5 km using 300 N of force. How much work does the horse do?

© Super Simple Sheets

Name: _____ 52

Curriculum Connection
D2.5

Calculating Work – Force x Distance

When we know two of the three parts of the equation for work, we can determine any of the missing variables.

For example, Jaylene did 2000 J of work pulling a suitcase 200 metres. Therefore our equation looks like this:

Work = force x distance
2000 = force x 200
Therefore, force = 10 N



PREVIEW

Calc ...le below finding the missing values.

	Force	Distance	Work Done
1)	350 N		7 000 J
2)			22 500 J
3)	825 N		660 000 J
4)		km	525 000 J
5)	1550 N		750 J

Word Problems How much work is done in the questi... lo...

1)	A baseball player does 2480 J of work when hitting a baseball. The ...ed 80 m away from home plate. How much force did they use to hit the ball?
2)	A backhoe uses 225 000 J of force to move a pile of dirt. The backhoe used 3000 N of force to lift the load. How far did it take the load?
3)	Evan picked up two weights and went for a walk. He used 450 N of force to pick up the weights. He completed 27 000 J of work. How far did he walk with the weights?

© Super Simple Sheets

Name: _____ 53

Curriculum Connection
D2.6

Simple Machines – Mechanical Force

Simple Machines

Simple machines are the basic mechanical devices that allow us to apply more force. A simple machine provides us with a mechanical advantage when doing work. This allows us to use less force when completing everyday tasks.

There are 6 types of simple machines: levers, wheels and axles, pulleys, wedges, screws, and inclined planes. To apply an even greater mechanical advantage of force, we can combine simple machines to make compound machines. Examples of compound machines are: can openers, and staplers.



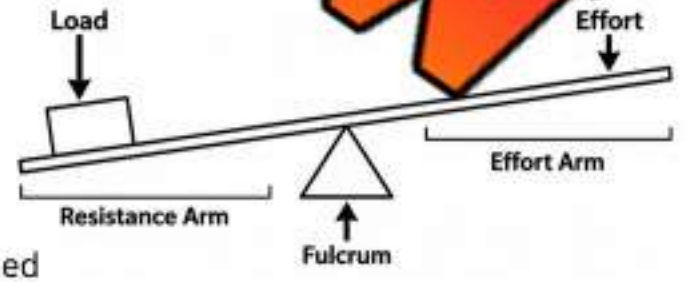
PREVIEW

Mechanical Advantage

The mechanical advantage of simple machines gives us can be calculated using the following formula:

$$MA = \frac{force\ needed\ without\ a\ simple\ machine}{force\ needed\ with\ a\ simple\ machine}$$

Using this formula will tell us how much of a mechanical advantage is received by using a simple machine. For example, if we were lifting a rock that might require 300 N of force without the help of simple machines. With a simple machine like a well-designed lever, we could lift the same rock with half the amount of force. In the example above, our MA would be:



$$MA = \frac{300}{150} = 2$$

The mechanical advantage made the work two-times easier. The load did not change, but our force was **magnified**. When we inputted 150 N of force into the lever, the output force was 300 N, making our MA 2.

Mechanical Advantage of Simple Machines

The mechanical advantage of simple machines is not always two. A poorly designed lever could actually have a negative mechanical advantage if the effort arm was shorter than the resistance arm. The mechanical advantage of each simple machine needs to be calculated based on the design and components of the machine.

© Super Simple Sheets

Name: _____ 54

Curriculum Connection
D2.6

Calculate Calculate the mechanical advantage below.

	Force Without Simple Machine	Force With Simple Machine	Mechanical Advantage
1)	500 N	100 N	
2)	1000 N	125 N	
3)	840 N	210 N	
4)	675 N		5
5)		275 N	4

Calculate Calculate the mechanical advantage below.

	Simple Machine	Input	Output	Mechanical Advantage
1)	Pulley	N	00 N	
2)	Lever	525 N	3	
3)	Inclined Plane	180 N	N	
4)	Screw	760 N	0 N	
5)	Wedge		2 990	6.5
6)	Wheel and Axle	875 N		

PREVIEW

Question Why do we need simple machines? When did you use one today?

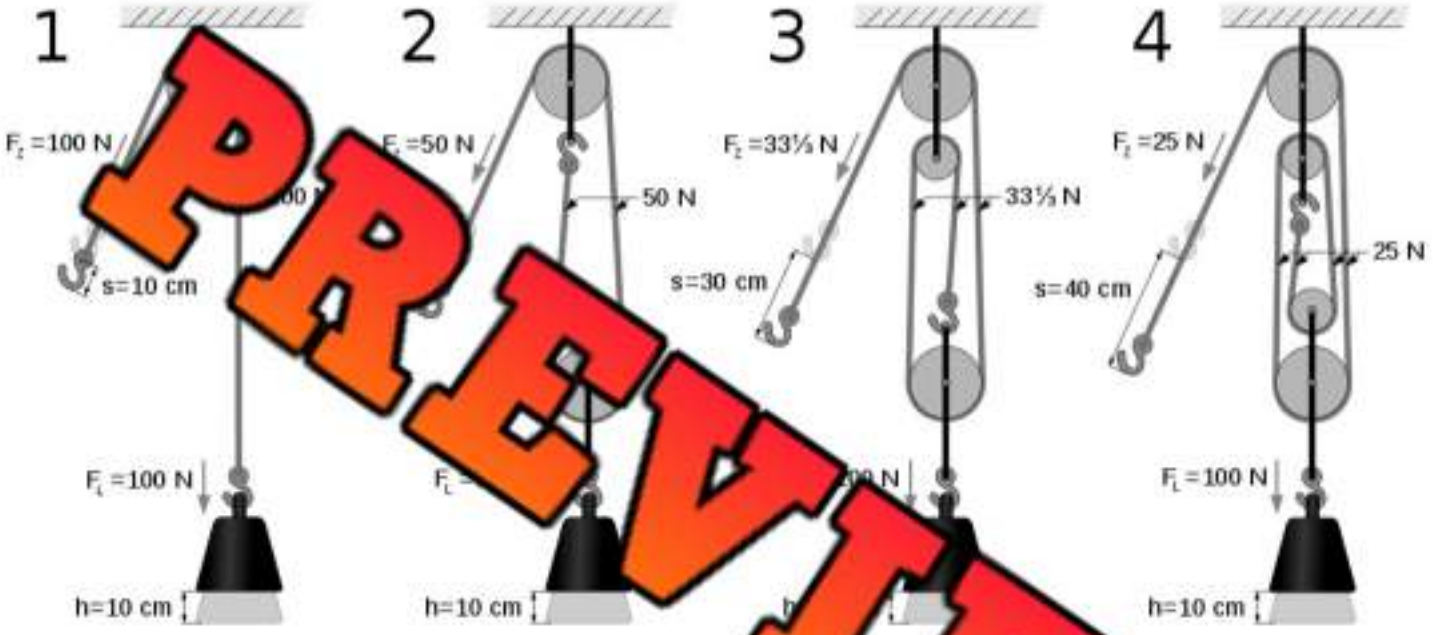
© Super Simple Sheets

Name: _____ 56

Curriculum Connection
D2.6

Pulley System – Force/Distance Ratios

Force and Distance Ratio
Using a pulley system allows for a mechanical advantage to make a load easier to move. When we add a pulley, it changes the amount of force you need to apply into the pulley, however, it also changes the distance you need to pull. In the diagram below, the differences between using 1 pulley compared to 2, 3, and 4 are outlined.



PREVIEW

Questions Fill in the table below and answer

Number of Pulleys	Load	Force Required (N)	D (cm)
1	100 N		
2	100 N		
3	100 N		
4	100 N		

1) What do you notice happens to the relationship between force required and distance to pull when you add a pulley?

2) When would you use extra pulleys? When would just one pulley be enough?

© Super Simple Sheets

Name: _____ 57

Curriculum Connection
D2.6

Gear Ratios – Velocity and Torque

Gears – Increasing Torque (Force) and Velocity



Gears are used to increase the torque that is applied from the driver gear onto the driven gear. Determining the gear ratio in a gear pair helps us determine the mechanical advantage. The gear ratio formula uses the number of teeth on the gears.

$$MA = \frac{Driven}{Dri}$$

If we appl force into the larger gear, the gear ratio becomes 14/28. We can multiply ply into the gear pair by the gear ratio to determine the output force x (14/28) = 5 N. We are needing to use more force to turn the larger than w ving from the smaller gear, but the smaller gear is turning more, which m t more velocity, not torque.

On the o we a N of force into the smaller gear, the resulting force from the larger ge ld be 20 N, providing two times more torque, but half as much velocity.

PREVIEW

Questions Use information the your answer.



1) What is the g ratio in ict the left if the smaller gear is the driver gear?

_____

2) If you apply 100 N of force i aller how much force would the larger gear have e d?

_____

3) Which is being increased, the velocity or torque? Explain.

_____

_____

4) If you apply 100 N of force into the larger gear, how much torque would be created from the smaller gear?

_____

_____

5. Which is being increased, the torque or the velocity? Explain.

_____

_____

© Super Simple Sheets

Name: _____ 58

Curriculum Connection
D2.6

Calculating Mechanical Advantage - Gears

Calculate Calculate the MA and output force in the examples below.

	Input Force	Driven Gear Teeth - Output	Driver Gear Teeth - Input	Gear Ratio	Output Force	Increased Speed or Torque
1)	100 N	15	5	15/5	300	Torque
2)	800	10	40	10/40	200	Speed
3)			16			
4)	550 N		36			
5)	875 N					
6)	1200 N	28	4			
7)	1500 N	24				
8)	2200 N	16	48			
9)	1750 N	32	8			
10)	1375 N	40	4			

PREVIEW

Word Problem Answer the questions below.



Julia is biking up a hill, so she changes her gears. She is pedaling a gear with 48 teeth on it that drives the driven gear that has 12 teeth.	
1) What is the gear ratio?	
2) Why did she choose this gear ratio to go up the hill?	
3) When she gets to a flat ground, what would be a good gear ratio if she had 32 teeth on her pedal gear?	

© Super Simple Sheets

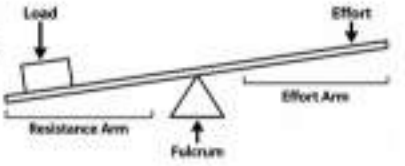
Name: _____ 59

Curriculum Connection
D2.6

Calculating Mechanical Advantage - Lever

Calculating Mechanical Advantage Using a Lever

To calculate the MA of a lever, you will need to know the lengths of the effort arm and the load arm. The formula is:



$$\frac{Effort\ Arm\ (length)}{Resistance\ Arm\ (length)}$$

This will give you the MA, which you can then use to determine how much force will be outputted based on how much force you inputted.

Calc the MA and output force in the examples below.

	Effort A	Load Length	MA	Input Force	Output Force
1)	50 cm			300 N	
2)	4 m	m		600 N	
3)	2 m	m		225 N	
4)	3 m	3 m		900 N	
5)	1.5 m	3 m		N	
6)	3.6 m	45 cm			5 800 N
7)	5.25 m	75 cm			4 760 N
8)	8.95 m		5	N	
9)		33 cm	7	410 N	
10)		1.2 m	3		894 N

PREVIEW

Word Problem Answer the questions below.

Steven uses a lever to pry a rock off the ground. He puts the fulcrum closer to the load to make it easier. The effort arm is 2.2m and the load arm is 40cm.	
a) What is the mechanical advantage?	
b) If Steven uses 400 N of input force, how much output force will he create?	
c) If the work requires 2500 N of force, will he be able to move it? What could he change?	

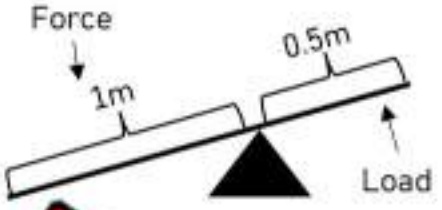
© Super Simple Sheets

Name: _____ 60

Curriculum Connection
D2.6

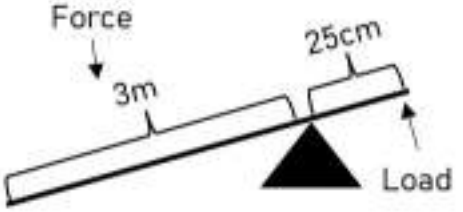
Calculate Calculate the MA and output force in the examples below.

1)



	750 N
Output Force	

2)



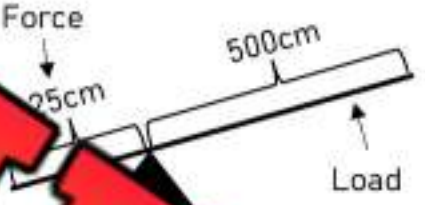
MA	
Input Force	915 N
Output Force	

3)



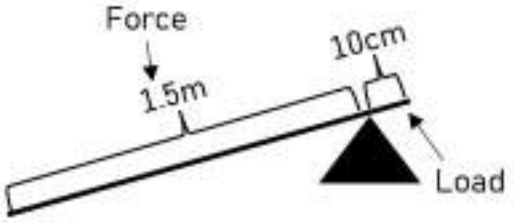
MA	
Input Force	348 N
Output Force	

4)



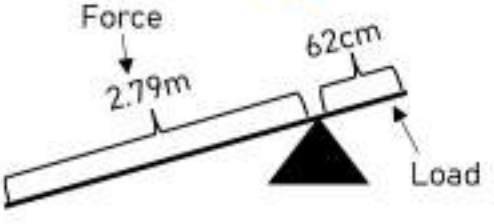
Output Force	

5)



MA	
Input Force	475 N
Output Force	

6)



MA	
Input Force	
Output Force	3222 N

PREVIEW

© Super Simple Sheets

Name: _____ 61

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

Experiment – Testing Different Levers

Research Question How does moving the fulcrum affect the force needed to lift a load?

Materials What you need for the experiment?

- ✓ Ruler
- ✓ Two cups
- ✓ Tape
- ✓ Weights – objects that all... marbles, paper clips, etc.)
- ✓ Fulcrum – metal binder clip, pencils ... ruler

Procedure How will you complete the experiment?

1) Tape the cups to the ends of the ruler.
2) Decide which side will be the load. Put a reasonable amount of weight into the cup that will be the load.
3) Put the fulcrum in the centre of the ruler. Add weights into the cup on the effort side of the lever until the lever is balanced. Record the weight you added (number of marbles).



4) Empty the effort cup but leave the same weight in the resistance cup. Put the fulcrum closer to the effort side of the ruler. Complete the same steps as above and record how much effort was needed to balance the lever.
5) Lastly, empty the effort cup again and repeat the same steps as above, but move the fulcrum closer to the resistance cup. Record your results.
6) Answer the questions on the backside of the page.

PREVIEW

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

Observations What did you notice as you completed the experiment?

Fulcrum Position	Fulcrum Position on Ruler – cm or mm	Weight in Load Cup	Weight in Effort Cup
In the Middle			
Close to Effort Cup			
Close to F e			

PREVIEW

Results An ues ns below.

1) What position allo the force to move the load? Explain why this was the case.

2) Was there a relationship between the number of mm the nt of weight needed to move the load? Explain.

3) What distance from the load on the ruler gave a mechanical advantage of 2 (you needed half as much weight to lift the load). What distance provided an MA of 3 and 4?	
MA of 2	
MA of 3	
MA of 4	

© Super Simple Sheets

Name: _____ 63

Curriculum Connection
D2.6

Calculating Mechanical Advantage – Inclined Plane

Calculating Mechanical Advantage Using an Inclined Plane

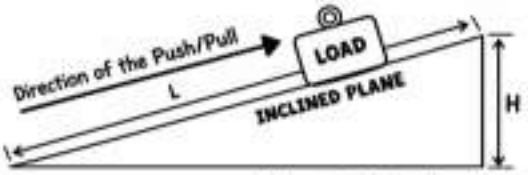
An inclined plane is used to allow us to move a load using less force. There is a trade-off though. The longer the inclined plane, the further the distance is that we need to move the load.

Picture this, your standing at the edge of a moving truck that is 1.5 m tall. You want to move a box up to the opening of the truck. You would only need to lift it 1.5 m if you lifted it straight up. But, if the box is too heavy, you could use an inclined plane to increase your force acting...

Ramp ... each 1.5 m tall, you could create a mechani... of 2 by making the ramp 3 metres long...

$$MA = \frac{length\ of\ s... \quad 3}{height\ of\ slope \quad 1}$$





Mechanical advantage (MA) = (L) Length of the slope / (H) Height of the slope

PREVIEW

Calculate Calculate the ... using ... ...bles below.

	Length of Slope	Height of Slope	MA
1)	60 cm	20 cm	
2)	3 m	0.5 m	
3)	4.5 m	75 cm	
4)	6 m	1.5 m	
5)	10 m	2.5 m	

	Leng... Sl...	Height of Slope	MA
6)			3
7)			5
8)			4
9)		1	6
10)		2... m	10

Word Problem Answer the questions below.

Hilary can produce 500 N of force to lift a box. The box she needs to lift onto a ledge is 1.75m tall. She will need to be able to produce 2000 N of force to move the box. If she uses a ramp, how long should her ramp be so that she can move the box?

© Super Simple Sheets

Name: _____ 64

Curriculum Connection
D2.6

Calculate Draw a diagram of the situations below and answer the questions.

1) Jack needs to move a bag of dirt onto a cliff. The cliff is 3 metres high, so he can't reach it. He knows he can exert 300 N of force, but it will take 1 500 N of force to move the bag up 3 metres.

a) If he make the ramp 6 metres long, will he be able to move the bag onto the cliff? Explain.

b) What eal ramp length to allow him to move the dirt onto the cliff?

2) Luke built a ra ove h washer into his truck. The pressure washer is heavy, so it requires 9 N it into the truck. He can produce 600 N of force.

a) What mechanical advanta s h lined plane to provide him?

b) He built the ideal ramp length of 280 cm. h is th

3) Ashley needs to move a piano onto a moving truck. She needs 2 2 N , but can only produce 400 N. She is going to use a ramp to move the piano.

a) What mechanical advantage does she need the inclined plane to provide her?

b) She pulled out the ramp on the truck. The truck is 125 cm tall, and the ramp is 500 cm long. Will she be able to move the piano onto the truck? Explain.



c) How long of ramp does she need to move the piano onto the truck?

PREVIEW

Name: _____ 66

Activities – Machines and Physics

Word Search Find the words from the word bank.

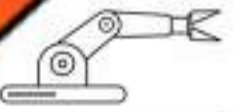


Energy	Work	Force	Physics	Magnetism
Friction	Simple	Machines	Displacement	Distance
Mechan	Advantage	Dissipating	Automation	Efficiency

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

PREVIEW

Word Scramble Unscramble the words from the word bank.



LSIPEM		CIHPYSS	
FCORE		MEHIACNS	
NPLIMEATDSCE		GNEEYR	
TNMEIASGM		TSDACEIN	
NAEAADVGT		ITORCNIF	

© Super Simple Sheets

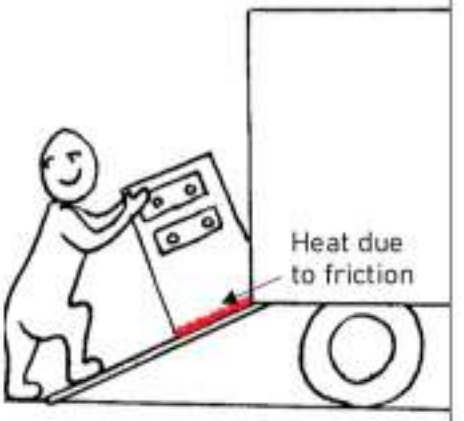
Dissipating Energy in Mechanical Systems

What is Dissipation of Energy?

The term **dissipation** is commonly used to describe ways in which energy is wasted. When we use mechanical systems, there is often energy wasted, meaning some of the energy lost was not used for the intended purpose of the machine.

Dissipation by Friction

Many simple machines have to deal with friction causing a dissipation of energy. For example, when you push a box up a ramp, the work might be easier than picking it up, depending on the frictional force resisting the movement of the box.

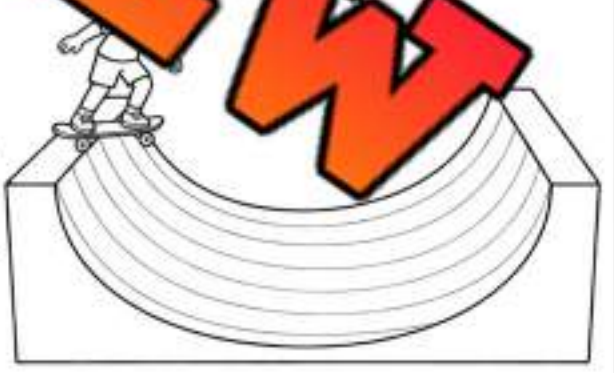


If the two surfaces – the box and the ramp are made out of materials that increase friction, the box will not slide as well. The work lost due to energy created, as the mechanical energy used to move the box will result in movement of the surfaces and thermal energy. Examples of these surfaces include sandpaper and carpet.

If materials are used to reduce friction, like ice, there will be less wasted thermal energy. Ice is an example of a surface with low friction. If you were sliding a box along ice, there would not be as much dissipated thermal energy.

Example of Frictional Dissipation

If we drop a skateboard down a half-pipe ramp, its potential energy at the top of the ramp is converted to kinetic, mechanical energy as it moves down the ramp. When it gets to the other side, it doesn't go as high up the ramp as it was when it started. As it travels back to the original side of the ramp, it makes it less far and eventually it will stop in the middle.



The reason it cannot travel up and down forever is because of friction. The wheels on the skateboard are creating **rolling friction** that creates thermal energy that could not be used to move the skateboard. In addition, the skateboard moving through the wind is creating **frictional drag** which produces more thermal energy that is dissipated.

With the dissipated energy, the skateboard loses energy as it moves up and down the ramp. This results in it reaching lower levels on the ramp each time.

PREVIEW

© Super Simple Sheets

Name: _____ 68

Curriculum Connection
D2.7

Questions Use information from the text to support your answer.

1) What does it mean for a mechanical system to dissipate energy?

2) How do[illegible]iction cause dissipation of energy? Give an example.

PREVIEW

Explain How is the cav[illegible]atin



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

1) Friction often causes unintended wasted energy.	True	False
2) Some materials create more friction, which creates dissipation.	True	False
3) Dissipation is high when pushing a box along ice.	True	False
4) Dissipation is high when sliding a box along a wooden ramp.	True	False
5) Dissipation is a result of wasted and unintended thermal energy.	True	False

© Super Simple Sheets

Name: _____ 75

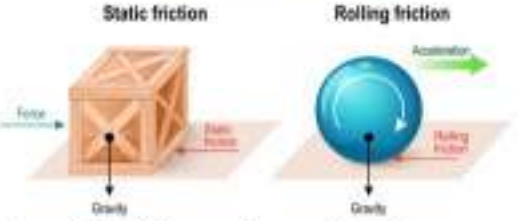
Curriculum Connection
D2.7

Technologies That Reduce Friction

Three Types of Friction
There are three types of friction – static, rolling, and sliding.



Static Friction – The frictional force that opposes any applied force by keeping it still. For example, there is static friction between your desk and the floor because the desk is stationary. If you push the desk and it moved, yo lied force has overcome the static friction.



Sliding ional force that resists the move of two s at slide against one another. hen yo dest and it begins to move, it will still require a lot of applied force is s friction.

Rolling Friction – tiona e sist the motion when an on object rolls over it. This happens when y et, a cylinder over a surface.

Technologies Reducing Frict
To reduce the frictional force tha fect is needed to do work, numerous technologies have been developed.

1) **Furniture Sliders** – When moving furniture ar a roo static friction often makes it difficult to move the objects. Furn iders er each part of the furniture that is in contact with the ground's s ce rubber on one side to create a lot of friction between the slider niture doesn't move. On the other side, the sliders are made of felt, which ery reduces the friction. This reduction in sliding friction allo us t ith less force.

2) **Lubricants** – A lubricant reduces friction between two surfaces by ac a slippery substance so they can slide past each other. Under the hood of a vehicle, lubricants allow engines and gearboxes to run smoothly. If you've ever touched a machine's engine, you've likely felt the grease get on your hands. Engines have a lot of moving parts, which means they need to be lubricated so they can run efficiently, so they do not create dissipated heat energy.

3) **Wheels** – Using wheels to move an object reduces frictional forces. A wheel reduces friction by allowing the contacting surfaces to roll rather than to slide over each other. Ball bearings are a technology used to reduce rolling friction even more. They use balls to separate two bearing rings that roll instead of slide. Ball bearings can hold a large load, so they are used in vehicles, bicycles, and skateboards.



PREVIEW

© Super Simple Sheets

Name: _____ 76

Curriculum Connection
D2.7

Definitions

What do the forms of friction mean?

Static Friction	
Sliding Friction	
Rolling Friction	

Questions

information from the text to support your answer.

1) How liding e friction and make work easier? Explain.

2) Why are lubricants important in a veh

3) What are ball bearings? Why are they useful?

PREVIEW

True or False

Circle whether the statement is true or false.

1) Sliding friction is weaker than rolling friction.	True	False
2) Lubricants are added to systems to reduce sliding friction.	True	False
3) Lubricants, wheels and slippery surfaces reduce dissipation.	True	False
4) Lubricants can be added to slippery surfaces to reduce friction further.	True	False

© Super Simple Sheets

Curriculum Connection
D2.7

Exit Cards

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

Name: _____

Fill in the blanks using the word bank.

Ball Bearings	Rolling Friction	Mark	
Furniture Sliders	Static Friction	Lubricants	

1) _____ prevents an object from moving until enough force is applied.
2) _____ reduce friction by allowing surfaces to slide smoothly.
3) _____ help move heavy objects across floors with less effort.
4) _____ use small metal balls to reduce friction between moving parts.
5) _____ occurs when a wheel or ball moves across a surface.

Name: _____

Fill in the blanks using the word bank.

Ball Bearings	Rolling Friction	Mark	
Furniture Sliders	Static Friction	Lubricants	

1) _____ prevents an object from moving until enough force is applied.
2) _____ reduce friction by allowing surfaces to slide smoothly.
3) _____ help move heavy objects across floors with less effort.
4) _____ use small metal balls to reduce friction between moving parts.
5) _____ occurs when a wheel or ball moves across a surface.

PREVIEW

Name: _____ 78

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

Experiment – Sticky Note Friction

Research Question What is the maximum number of sticky notes weaved together that you could pull apart? Explain your hypothesis below.

_____

_____

Materia ...t will you need for the experiment?

- ❑ 2 pads of sti...
- ❑ Pen or penc...
- ❑ Recording sheet



Procedure How will you ...mple... ...nt?

1) Split the sticky notes up so you have two pil... 10, ...0 notes
2) Start with interweaving the two piles of 5 n... ...o th... ...ing the pages of each stack one at a time.



3) Pull the stacks to see if you can separate them. Try holding them as shown in the picture, or horizontally like in the picture above. Write down your results.



4) Perform the same instructions as above, but with the stacks of 10 notes.
5) Next do the stack of 20, and then the stack of 30 notes.
6) Answer the questions on the back of this page.

PREVIEW

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

Observations Could you pull apart the notes?

Number of Notes in Stack	Could Pull Apart? Yes or No?
5	
10	
20	
30	

Results Answer the questions below.

1) What forces are holding the notes making them difficult to pull apart? Explain.

2) If you have time, find the number of notes that you could no longer pull apart?

3) Did you have the same results as the groups around you? What could have impacted the difference in results?

4) If you pulled the notes apart while they were horizontal, was it easier to pull them apart while they were vertical? Explain.

5) How was normal force part of this experiment? Explain what normal force is and how it acted on the notes.

PREVIEW

Name: _____ 80

Curriculum Connection
D2.7

Research – Lubricants Used In Vehicles

Learn more about how lubricants are used in vehicles to reduce friction and dissipation by answering the questions below.

Research Answer the questions below.



1) What ar[illegible]h of the types of oil below and how are they used in a vehicle?	
Engi[illegible] And Gear Oil	
Grease	
Penetrating Lubricant	
Dry Lubricant	

PREVIEW

2) How often should you get the oil changed in your car? Why do you need to change your oil?

3) What would happen if your vehicle had no oil?

4) How does using ants make burn less fuel?

5) What is oil viscosity?

6) What is the best oil viscosity for warm climates? Explain why.

7) What is the best oil viscosity for cold climates? Explain why.

PREVIEW

© Super Simple Sheets

Name: _____ 82

Curriculum Connection
D2.4, D2.8

Calculating Efficiency

Calculating Efficiency of Machines

Machines are built to serve a purpose. When all the energy used to power the machine is used for the intended purpose, the machine is operating at 100% efficiency. But, if a machine dissipates energy, the machine won't be as efficient. To calculate the efficiency of a machine, we use the following formula:



$$\text{efficiency} = \frac{useful\ energy\ out}{total\ energy\ in}$$

For exam op uses a total of 100 J of energy in one hour. 12 J of energy was wasted d the rest was useful energy out. Therefore, the efficiency is:

$$\text{efficiency} = \frac{88}{100} \text{ or } 0.88$$

We can write t enta ting that the laptop has an energy efficiency of 88%.

PREVIEW

Calculate Determi iency the values below.

	Useful Energy Out	Total Energy	cimal	Efficiency - Percentage
1)	75 J	100 J		
2)	120 J	200 J		
3)	21 J	50 J		
4)	200 J	250 J		
5)	480 J	500 J		
6)	230 J	300 J		
7)	210 J	600 J		
8)	620 J	1000 J		
9)	1550 J	2000 J		
10)	5210 J	6000 J		

© Super Simple Sheets

Name: _____ 83

Curriculum Connection
D2.4, D2.8

Calculate Fill in the table by finding the missing values.

	Useful Energy Out	Total Energy In	Efficiency - Decimal	Efficiency - Percentage
1)		40 J	0.5	
2)		200 J	0.75	
3)		200 J		60%
4)		350 J		80%
5)		820 J	0.45	
6)			0.90	
7)				35%
8)		1500 J		62%
9)		2425 J		
10)		3540 J		

PREVIEW

Word Problem Answer the questions below.

Mark is shopping for a new fridge. Fridge one produces 600 J of useful energy in one hour and requires 850 J of total energy in. Fridge two uses 900 J of total energy in one hour. It has an efficiency percentage of 77%.



a) How much useful energy out does fridge two produce?	
b) Which fridge is more energy efficient?	
c) Which fridge should he choose if he wants to use less energy?	
d) Which fridge should he choose if he wants an energy efficient fridge with more features?	

© Super Simple Sheets

Name: _____ 84

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

Experiment – Energy Efficiency

Research Question — What are we learning about?

What does efficiency mean? How can one lightbulb be more efficient than another light bulb? How much heat do inefficient light bulbs produce? Do light bulbs that give more light produce more wasted heat?

Materials — What will you need for the experiment?

- ❑ Lamp
- ❑ Thermometer
- ❑ 25-watt Incandescent bulb
- ❑ 100-watt Incandescent bulb
- ❑ 2 fluorescent bulbs that produce light comparable to the incandescent bulbs



Incandescent Bulb

Procedure — Complete the steps below to find the experiment.

1) Put a 25-watt incandescent light bulb into the lamp and turn it on.

2) Hold the thermometer about 5-10 cm above the bulb for one minute and record the temperature.

3) Turn off the lamp.

4) Let the bulb cool and then take it out.

5) Repeat the procedure above using the 100-watt incandescent bulb. Record the temperature.

6) Repeat the process above using the fluorescent bulbs. Record the temperatures for both bulbs.



Fluorescent Bulb

PREVIEW

Name: _____ 85

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

Observations | What happened?

Light Bulb	Temperature
Temperature with light off	
25-watt Incandescent Bulb	
100-watt Incandescent Bulb	
Weaker Fluorescent Bulbs	
[illegible]er Fluorescent Bulbs	

Results | A[illegible]questions below.

1) Which type of lig[illegible]sipat[illegible]? Explain.

2) Does a light that produces more light dissipa[illegible]e hea

3) Which lightbulb is more efficient? Explain using the terms work, energy, and dissipation.

PREVIEW

Name: _____ 93

Curriculum Connection
D1.1, D2.9

Technological Innovations Improving Productivity

Technological Innovations Changing Industries

Innovation refers to both the creation of new technologies and to their adaption for use in a variety of industries. Businesses use technological innovations to accelerate productivity and increase profitability.

Examples of Technological Innovation Involving Mechanical Systems

Robotics

The use of ...ts in creating machines is not new, as they have ...ating vehicles in assembly lines since 19... ...s not walking and talking robots, but r... ...a... ...t can easily move heavy compo... ...and a... ...r adhesives quickly and efficiently. Usin... ...so s... as workers are not exposed to ...s, or ...icals involved with adhesives an...



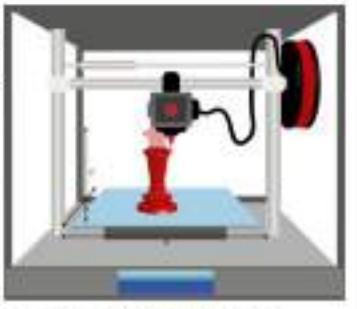
Industrial autom... ...robotics in handling various processes and machinery to increase ... pro... speed, and quality. Having automatic manufacturing also cuts down ...ste ...es do not make mistakes that humans make.

Artificial Intelligence (AI)

The use of AI can increase productivity in manuf... ...g faci... ...t, AI is used to perform quality checks to detect flaws in produ... ...t are ... ...d. The AI, also known as smart robots, are able to detect flaws tha... ...erts m... ...t be able to see.

Second, AI has the ability to predict when machinery ... ...t. S... equipment give the AI data on the movement of the machine which a... understand when the machinery will fail, and when it needs mainter... ...ictive technology AI offers is ensuring manufacturing companies are not experi... shutdowns due to system failures, which is increasing their productivity an... efficiency.

Additive Manufacturing (3D Printing)



The use of 3D printing by manufacturing companies is allowing them to mass-produce items to get them to market quicker and at a lower cost. **3D printing** is when a printer is connected to a computer, allowing the user to create an object on the computer and print it in 3-dimensions. The printer is a machine that creates objects by layering materials, like plastics to create objects that differ in shape, size, rigidity, and colour.

3D printing is now being used by most manufacturing companies. It's advantages include faster production, flexible designs, printing on demand, less cost, fast design, and less waste.

PREVIEW

Name: _____ 94

Curriculum Connection
D1.1, D2.9

Questions

Use information from the text to support your answer.

1) How are technologies affecting the manufacturing sector? What advantages do these technologies offer?

2) Why i[illegible]robots to make cars than humans?

PREVIEW

Questioning

Write 3 questions yo[illegible]about [illegible]ding.

1)	
2)	
3)	

True or False

Circle whether the statement is true or false.

1) A 3D printer wastes a lot of material when printing objects.	True	False
2) Humans are more accurate with their work than robots.	True	False
3) The use of robotics, AI, and 3D printing increases production.	True	False
4) When manufacturing is more efficient, products cost less for consumers.	True	False
5) Using robots reduces the quality of the products being made.	True	False

© Super Simple Sheets

Name: _____ 95

Curriculum Connection
D1.1, D2.9

Research – Industry 4.0

The manufacturing industry has undergone 4 industrial revolutions and is currently in its 4th stage, called industry 4.0. Learn more about the evolution of industrialization below.

Research Answer the questions below.

1) What does Industry 4.0 refer to?

2) Summarize [illegible] in the [illegible] of industrialization.

1.0	
2.0	
3.0	
4.0	

PREVIEW

© Super Simple Sheets

Curriculum Connection
D1.1, D2.9

3) Draw a picture that symbolizes each stage in the evolution of industrialization.

1.0	2.0	3.0	4.0

4) What [illegible]ne Ind[illegible]net of Things (IIOT)?

5) What are smart sensors in manufacturing? How do they improve [illegible]

PREVIEW

Name: _____ 97

Curriculum Connection
D1.1, D2.9, D2.10

Autonomous Self-Driving Vehicles

What is an Autonomous Self-Driving Vehicle?
An **autonomous self-driving vehicle** is a vehicle that can sense its environment and operate without human involvement. In an autonomous vehicle, a human passenger would not need to take control of the vehicle at any time, or even be present in the vehicle at all.

How Does an Autonomous Self-Driving Vehicle Work?
Autonomous vehicles create and maintain a map of their surroundings as they drive. These cars use smart sensors situated in different parts of the vehicle that monitor the position of other vehicles.

The [illegible] uses radar, GPS, and cameras to assist with its self-driving capabilities. Radar is used to tell the vehicle's computer how fast other vehicles are moving. It can allow it to adjust its own speed. GPS is used to provide the position of the vehicle and to navigate the vehicle to its destination. GPS provides quality [illegible] are necessary for self-driving vehicles to stay on the road. Cameras are used to see and identify traffic lights, signs, and animals.

Impacts of Autonomous [illegible]

- Self-driving vehicles may [illegible] main benefit will be to reduce car accidents. As of now, 94% of [illegible] accidents are caused by driver error. If all vehicles on the road were self-driving, they would be able to communicate with each other, which would reduce or eliminate human driver errors.
- Accidents involving unsafe drivers would be reduced. For example, impaired drivers would be off the roads, as well as drivers who are distracted.
- People with disabilities, like the blind would be able to use self-driving vehicles. Seniors who have lost their license could continue to be independent and use self-driving vehicles. Self-driving vehicles would enhance the independence of anyone who cannot currently drive a vehicle.
- Riding in a self-driving vehicle allows you to be more productive. Instead of driving, you can focus on getting things done, or enjoy watching a movie.
- Less traffic will be a result of fewer accidents. When humans drive in traffic, they make it worse by braking too often, which creates a chain reaction of braking. Self-driving vehicles will all communicate with each other, ensuring they move quickly with a consistent distance between vehicles.



- Fewer traffic jams means less greenhouse gases because cars are not idling. This will have a positive impact on the environment.

PREVIEW

Name: _____ 98

Curriculum Connection
D1.1, D2.9, D2.10

Questions
Use information from the text to support your answer.

1) What is an autonomous self-driving vehicle? How does it work?

2) How wil[illegible]lf-driving vehicle impact our society?

PREVIEW

Reaction
What do you [illegible]ld b[illegible]est impact of autonomous vehicles?

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

1) Self-driving cars would need to be driven by people who can drive now.	True	False
2) Autonomous vehicles can drive without someone in the car.	True	False
3) Self-driving vehicles will cause more accidents than we have now.	True	False
4) Autonomous vehicles use sensors, radar, GPS and cameras.	True	False
5) They will allow people with disabilities to be more independent.	True	False

© Super Simple Sheets

Name: _____ 99

Curriculum Connection
D1.1, D2.9, D2.10

Impacts of Automated Systems

Impacts of Automated Systems
The automation of systems has affected society, the economy, and the environment in many ways.

Society – Social Impacts
Automation has affected people positively and negatively. On one hand, automation has improved the quality of life for many people. Automation has made more things affordable for more p because of the mass production in the manufacturing sector. It has also led to new tec and better quality products for people to enjoy.

Au ade workplaces safer. Machines can complete unsafe work, like liftin machines to handle dangerous chemicals.

autom hanged the hours people need to work. Before automation, in the early 1900s, th ork week was 70 hours. Today, the average work week is about 40 hours can b in less time with automation.

Automation drawb ople. Mainly, machines can take jobs from people, causing more unempl more wealth inequality, as a small number of business owners can crea d mo tion, making them more wealthy and their former employees unem

Economic Impacts
Automation has impacted the economy ways ced the costs of production, which has made products and services more afford has new jobs that are more creative and less repetitive. For example, s ca boring, repetitive jobs that people used to do all day long. Industries ployees with specialized skills to create software for machines and e equi

If businesses make more money, they will be taxed y, the government to earn more money to spend on public goods, lik ads Automation also ensures that manufacturing jobs can stay in countrie re high-skilled workers can be paid a proper wage. Without automation, cturing jobs were sent to third-world countries where people could be paid a fract what they are paid here.



Environmental Impacts
Automation has both positive and negative effects on the environment. Automation has reduced the amount of waste created in manufacturing facilities as the machines do not make errors that humans make. The machines used to manufacture goods are efficiently using materials, which minimizes waste.

A negative impact on the environment is the mass production of goods. Our landfills and recycling centres are growing out of control due to the mass production of products that can be discarded because of their inexpensive nature.

PREVIEW

Name: _____ 100

Curriculum Connection
D1.1, D2.9, D2.10

Advantages/Disadvantages Fill in the table below.

1) What are the advantages and disadvantages of automation on society/people?	
Advantages of Automation	**Disadvantages of Automation**

2) What are the advantages and disadvantages of automation on the economy?	
Advantages of Automation	**Disadvantages of Automation**

3) What are the positive and negative impacts of automation on the environment?	
Positive Impacts	**Negative Impacts**

PREVIEW

Question How would life be different if we didn't have automated systems?

© Super Simple Sheets

Name: _____ 102

Curriculum Connection
D1.1, D1.2, D2.9, D2.10

Automation – Different Points of View

Points of View Below are different points of view about the impacts of automated systems. Write a different point of view that contrasts the views below.

1) People will lose their jobs to robots if automation takes over.

2) Mac will m nistakes in the manufacturing sector than humans make.

3) Factories make a lot of pollut so ate more factories, and will therefore be worse for the environmen

4) Automation increases production and decreases prices on produc ead to more waste in landfills.

5) Automation will cause the rich to get richer, and the poor poorer.

PREVIEW

Name: _____ 103

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

Coding – Autonomous Vehicles

Autonomous Vehicles and Coding

A self-driving vehicle needs around one billion lines of computer code for the car to drive safely. That is nearly 1,000 times more than the 145,000 NASA needed to land Apollo 11 on the moon.

Coding a S ing Vehicle

With a of code, it is obvious that coding a self-driving vehicle is compl . Usin rams to perform functions that the car needs to do is important in r mb ines of code used.

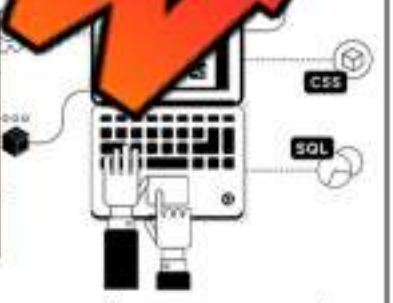
For example write for two common driving tasks – driving the speed limit and staying in

define speed
fetch speed limit data from GPS
drive speed limit

t side of vehicle
ght side
cle
on



Self-Driving Vehicle Program
when destination is selected
run speed
run lane



As you can see, the actual program that drives the vehicle now uses very few commands as it simply refers to the larger sub-programs. We only need to write the sub-program once and we can refer back to it over and over.

This program is clearly not complete, but it will allow the car to drive the speed limit and stay in its lane.

PREVIEW

Name: _____ 104

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

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

1) A self-driving vehicle doesn't use a lot of code.	True	False
2) Apollo 11 used more code than a self-driving vehicle.	True	False
3) A sub-program is used so that the programmer can write less lines of code.	True	False
4) You can name your sub-program any name you'd like.	True	False
5) A self-d vehicle uses 145 thousand times more code than Apollo 11.	True	False

Questic estions below using evidence from the text.

1) Why would pro when writing code for a self-driving vehicle?

2) What does a sensor do? Why are they useful i g?

PREVIEW

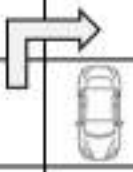
Directions Choose a task that a self-driving vehicle must do. Write a sh sub-program for the task.

© Super Simple Sheets

Name: _____ 105

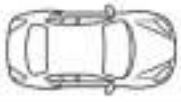
Curriculum Connection
A2.1

Self Driving Car – Writing Code

This is a self-driving car.	Right makes it turn right	Left makes it turn right	Forward makes the car move forward by the number shown
			
It und[illegible]and 3 commands	**Right**	**Left**	**Forward 1**

PREVIEW

Directions Write th[illegible] get the car full of recycling to the bins.





Code #1 – 2 Codes	Code #1 – 3 Codes	Code #3 – 3 Codes
_____	_____	_____
_____	_____	_____
_____	_____	_____

© Super Simple Sheets

Name: _____ 106

Curriculum Connection
A2.1

If Then Conditional Statements - Activity



PREVIEW

Directions Will the code get the car to the [illegible]ot, re[illegible] the code.

Code
Right
Forward 3
Left
Forward 5
Right
Forward 1
Left
Forward 1
Will it work?
Yes No

Code

© Super Simple Sheets

Name: _____ 107

Curriculum Connection
A2.1

Coding – Robot Lawn Mower

This is a self-driving lawn mower	Right makes it turn right	Left makes it turn right	Forward makes the car move forward by the number shown
	 	 	 
It und…	**Right**	**Left**	**Forward 2**

PREVIEW

Directions …code… …he lawn mower to cut the field of grass.

Codes – Forward, T… …Tu…	
Line 1	
Line 2	
Line 3	
Line 4	
Line 5	
Line 6	
Line 7	
Line 8	
Line 9	



© Super Simple Sheets

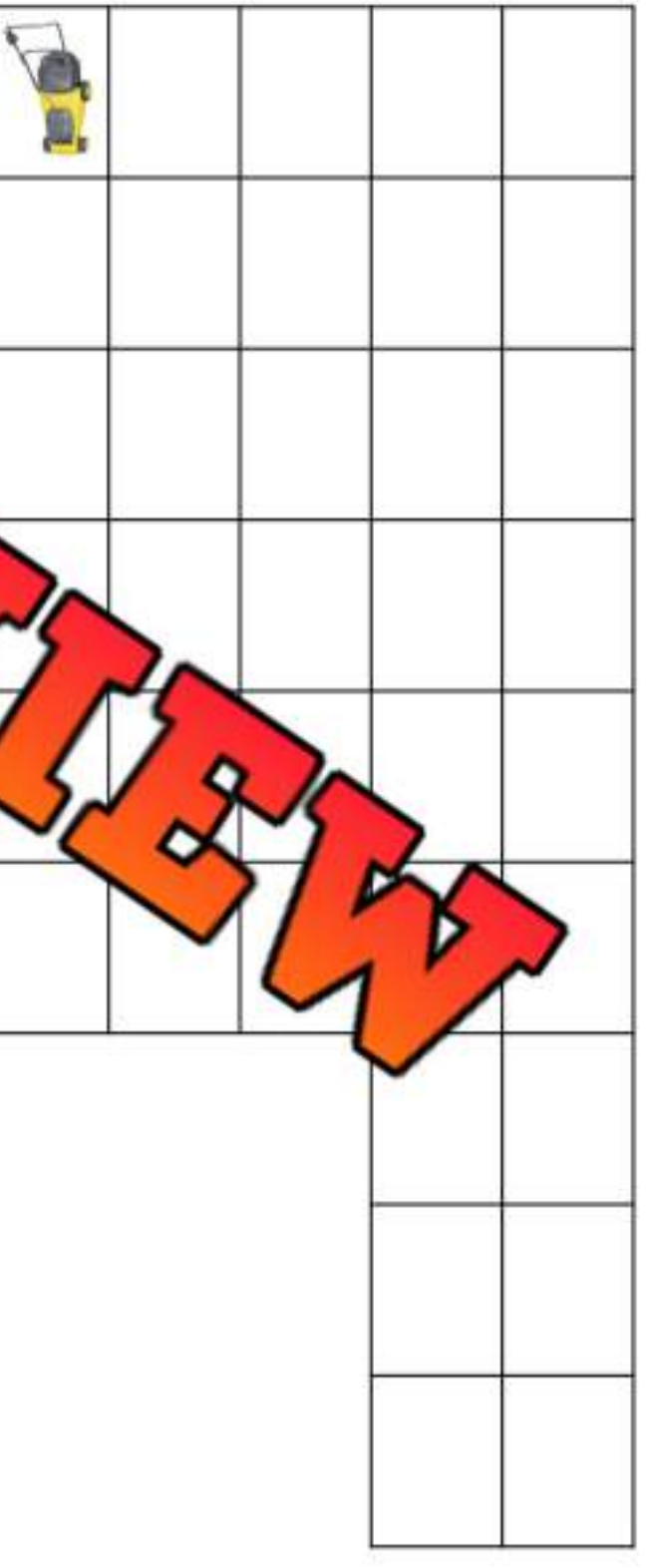
Name: _____ 108

Curriculum Connection
A2.1

Coding – Robot Lawn Mower

Directions Write code to get the lawn mower to cut the field of grass.

Codes – Forward, Turn Left, Turn Right	
Line 1	
Line 2	
Line 3	
Line 4	
Line 5	
Line 6	
Line 7	
Line 8	
Line 9	
Line 10	
Line 11	
Line 12	
Line 13	
Line 14	
Line 15	
Line 16	
Line 17	
Line 18	
Line 19	
Line 20	
Line 21	



PREVIEW

© Super Simple Sheets

Name: _____ 109

Curriculum Connection
A2.1, A2.2

Coding – A Bulldozer's Displacement vs Distance



PREVIEW

Coding

Write code to move the bulldozer to the ... find the distance and displacement travelled. The bulldozer moves from ... to another. Each square is 1cm squared. To find the displacement ... to use a ruler.

Job Site	Code	Distance	Displacement
1	Move left 13, up 8	21 cm	
2			
3			
4			
5			
6			
7			
8			
Total Distance		**Displacement at End**	

Name: _____ 110

Curriculum Connection
A2.1, A2.2

Coding – Robot Vacuum and Mop

A robot mop/vacuum has three main functions – move around, vacuum up dust and dirt, and mop up spills and messes. To write a program that allows a robot mop/vacuum to work, we'll need three subprograms.



Sub-Programs

Write 3 sub-programs for each of the tasks below. Use sensors to sense if there is a spill or if the vacuum needs to move from a wall or stairs.

Sub-Program for Moving Around

Sub-Program for M g

Sub-Program for Vacuuming

PREVIEW

Name: _____ 111

Curriculum Connection
A2.1, A2.2

Now that we have our sub-programs defined, we'll need if/then statements to tell the vacuum when to perform the sub-programs. For example, if the on button is pressed, run move (sub-program for moving around). The next line of code might be another if statement, stating that if a spill is detected, use the mop, else, use the vacuum.

Programming Write the program for the robot vacuum/mop.

Program for Robot Mop/Vacuum

PREVIEW

Draw Sketch a picture of your robot vacuum. Make sure to inclu
any buttons that are needed for the user to input a comman



Name: _____ 112

Curriculum Connection
A1.1, A3.1, A3.2, A3.3

STEM – Robot Technology

Robot technologies are improving people's lives by making our work easier. Robot vacuum's clean up our floors with the touch of a button. Robot lawn mowers will cut our grass without us even moving.

Think of another job that you don't like doing at home that a robot could do for you. Invent the robot by writing code that allows it to complete the job. Then decide how much you will sell it for and how much it will cost you.

You [illegible] think of an original idea or research robot technologies online. You could innovate a [illegible]isting idea by making it better.



Resc[illegible] An[illegible] questions below.

1) Which robot[illegible]y have[illegible]sen?

2) How will this robot techn[illegible]ke [illegible]s easier?

3) How does your technology work? Write at least 2 th[illegible] techn[illegible]oes. For example, a robot lawn mower moves and spins a blade. [illegible]ter[illegible]ub[illegible]rograms for each of these things your robot does.

PREVIEW

Name: _____ 113

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

Coding Write the code that allows your technology to work.

Write subprograms for each of the things your technology does.



© Super Simple Sheets

Name: _____ 114

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

Programming	Write code that gets your technology to work. Refer to the sub-programs you already have written.



© Super Simple Sheets

Name: _____ 115

Curriculum Connection
A1.1, A3.1, A3.2, A3.3

Draw Draw a sketch of your technology. Label the important parts that allow it to work.



© Super Simple Sheets

Name: _____ 116

Curriculum Connection
A1.1, A3.2

STEM Math connection – answer the questions below.



1) If you were making this robot, how much would it cost you to make?

2) How many units will you make at first?

3) H[illegible] cost you in total?

4) How much will you sel[illegible]or?

5) How much money will you gross (earn) if yo[illegible],000 [illegible] gross earnings, do not factor in the cost of each unit.

6) How much net profit will you earn if you sell 20,000 units? For net profit, you'll find the gross and subtract the cost to build the 20,000 units.

7) If you want to make $20 million in net profits, how many units will you need to sell?

PREVIEW

Name: _____ Date: _____

Unit Test – Systems in Action

Multiple Choice Circle the best answer.

1) What type of energy is released from splitting atoms? a) Chemical b) Mechani c) Electric d) Nu	2) Which non-contact force involves the movement of charged particles. a) Gravitational Force b) Electrostatic Force c) Magnetism d) None of the above
3) A ta erts w to support a water bottle on a) Applied Force b) Normal Force c) Spring Force d) Tension Force	4) Which term is a vector quantity, meaning it requires both magnitude and direction? a) Displacement b) Distance ed e
5) If 500 N of force was applied and pus for 300 m, how much work is done? a) 1000 b) 1 500 c) 15 000 d) 150 000	6) A l a heavier load by moving the dm c which end? a) tan b) Effor c) Middle d) None of the above

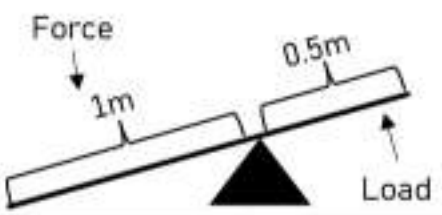
PREVIEW

Calculate Calculate the mechanical advantage below.

	Simple Machine	Input	Output	Mechanical Advantage
1)	Pulley	300 N	600 N	
2)	Lever	800 N	3 200 N	
3)	Inclined Plane	210 N	840 N	
4)	Screw	740 N	4 440N	
5)	Wedge		1 435N	3.5

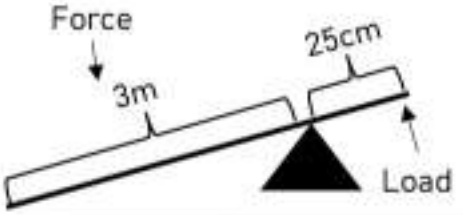
Calculate Calculate the MA and output force in the examples below.

1)



MA	
Input Force	625 N
Output Force	

2)

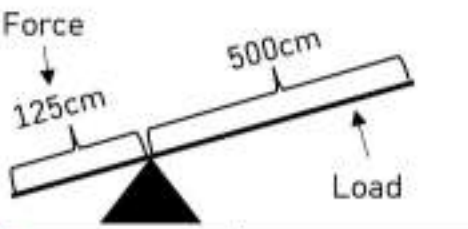


MA	
Input Force	775 N
Output Force	

3)



MA	
Input Force	
Output Force	1500 N



MA	
Input Force	
Output Force	1 220 N

PREVIEW

Questions Answer the questions below.

1) Describe a system you know well. What is the purpose, inputs, and outputs of the system.

2) How is energy dissipated from a mechanical system?

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

1) What technological innovations have improved productivity in manufacturing? How do these technologies improve productivity?

2) What are the impacts of automate[illegible]ns? H[illegible] they impact people, the economy, and the environment?

PREVIEW

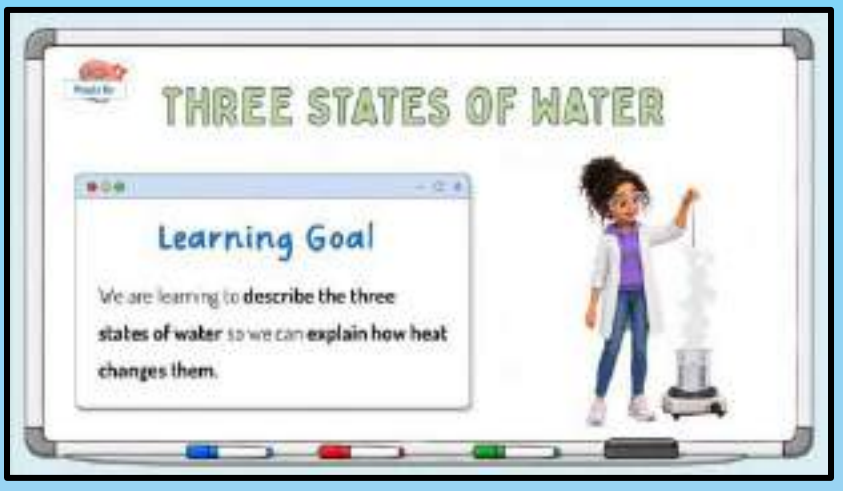
Google Slides Lessons Preview

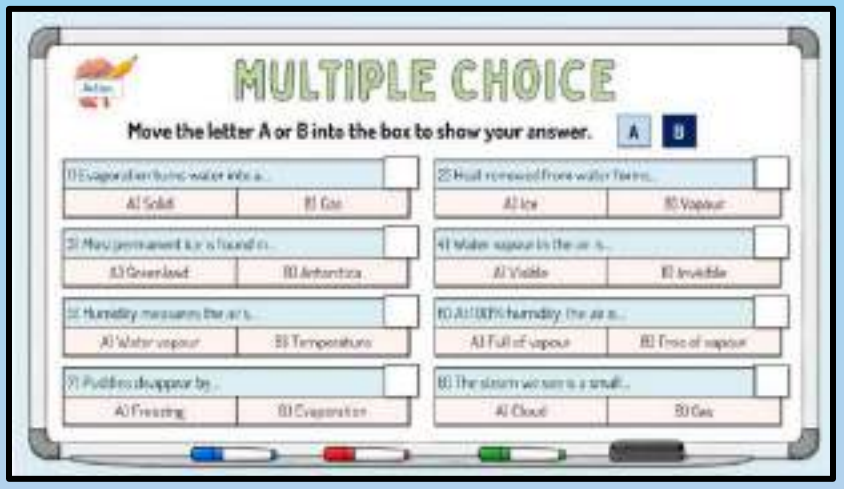
© Super Simple Sheets

Ontario Science Curriculum
Water Systems– Grade 8

3-Part Lesson Format

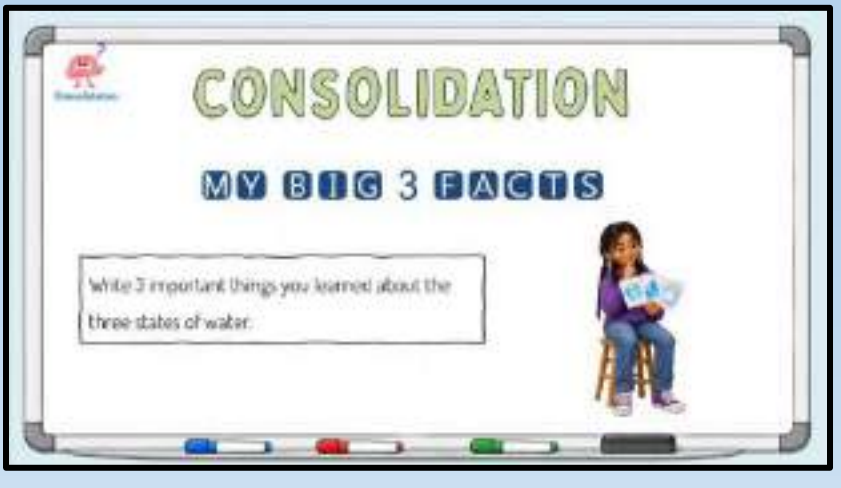
Part 1 – Minds On!
- Learning Goals
- Discussion Questions
- Quotes
- And More!





Part 2 – Action!
- Writing
- Matching
- Drag and Drop
- Drawing
- And More!

Part 3 – Consolidation!
- Exit Cards
- Quizzes
- Reflection
- And More!



Ontario Science Curriculum
Water Systems– Grade 8



Ontario Science Curriculum
Water Systems– Grade 8



5.51"

Workbook Preview

© Super Simple Sheets

Grade 8 Science Unit

Water Systems

E1 - Relating Science and Technology to Our Changing World
E2 - Exploring and Understanding Concepts

	Curriculum Expectations	Pages
E1.1	assess the social and environmental impact of the scarcity of fresh water, and propose a plan of action to help address fresh water sustainability issues	14-15, 37-48, 72-73, 76-85, 101-105
E1.2	demonstrate an understanding of First Nations, Métis, and Inuit knowledges and values about water, connections to water, and ways of managing water resources sustainably	106-109
E1.3	assess the impact of scientific discoveries and technological i	110-117
E2.1	i r t	55-56, 98
E2.2	d i	29
E2.3	explain how human activity and natural phenomena cause changes in the water table	30-32, 35-41
E2.4	identify factors, including climate change, that have contributed to the melting of glaciers and polar ice-caps, and describe the effects of this phenomenon on local and global water systems	42-48, 55-56
E2.5	explain changes in atmospheric conditions caused by the presence of bodies of water	50-60, 63-69
E2.6	describe various indicators of water quality, and explain the impact of human activity on those indicators	72-73, 76-85
E2.7	explain how municipalities process water and manage water usage	86-98, 101-105

Preview of 90 pages from this product that contains 191 pages total.

© Super Simple Sheets







STEM INVESTIGATION AND COMMUNITICATION SKILLS

Water Systems





© Super Simple Sheets

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	34, 122-123, 125
A1.2	use a scientific experimentation process and associated skills to conduct investigations	61-62, 74-75, 118-119
A1.3	use an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems	33-34, 70-71, 99-100
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	33-34, 61-62, 70-71, 74-75, 99-100, 118-119
A1.5	communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes	33-34, 61-62, 70-71, 74-75, 99-100, 118-119
A2.1	write and execute code in investigations and when modelling concepts, with a focus on automating large systems in action	121, 123, 126
A2.2	identify and describe impacts of coding and of emerging technologies, such as artificial intelligence systems, on everyday life, including skilled trades	120-123, 125-126
A3.1	describe practical applications of science and technology concepts in various occupations, including skilled trades, and how these applications address real-world problems	120-125
A3.2	investigate how science and technology can be used with other subject areas to address real-world problems	120-124
A3.3	analyse contributions to science and technology from various communities	120-125

© Super Simple Sheets

NAME: _____

WATER SYSTEMS



PREVIEW

© Super Simple Sheets

Name: _____ 8

Key Terms

Define | Research the meaning of each of the key terms

Glaciers	
Ice Sheet	
Watershed	
Global Water Cycle	
Well Water System	
Freshwater	
Aquifer	

PREVIEW

© Super Simple Sheets

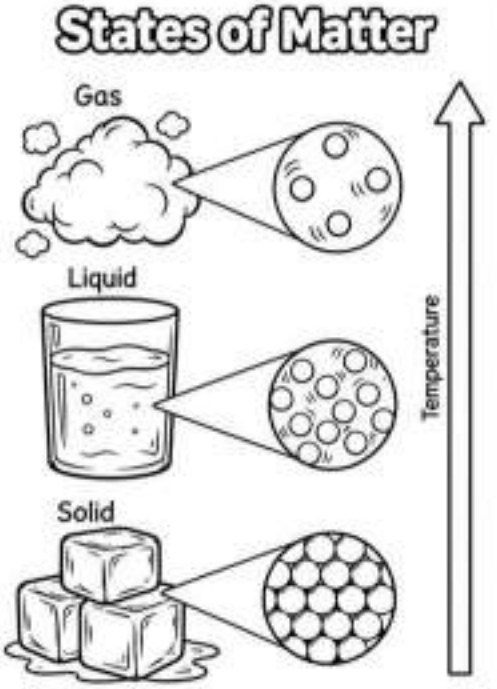
Name: _____ 9

Curriculum Connection
E2.1

Three States of Water

Three States of Water

Water in our environment can be found in three different states of matter – liquid, solid, and gas. **Matter** is anything that has mass and volume, meaning it takes up space. Water is an example of matter that can change through the three states of matter.



In our environment, when heat is added or removed from water it is possible for it to change states. For example, on a hot day, the sun's heat energy could turn liquid water into vapour, a gas. Alternatively, if a cold front moves in, the removal of heat from liquid water could turn it into solid ice.

PREVIEW

Liquid Water in our Environment

As a liquid, water exists in many forms. We have saltwater in our oceans, and freshwater lakes and rivers. The liquid form of water returns to the earth through precipitation.

When heat is added to liquid water, the warm water becomes a gas. The process is called evaporation and it helps explain why puddles disappear. Evaporation happens when the surface of a liquid is exposed to heat. When heat is removed from liquid water on a cold day, the liquid will turn into solid ice. We've all seen this when a puddle has frozen.

Solid Ice in our Environment

Solid ice is frozen water, meaning we can find ice forming on lakes, rivers, and oceans in cold temperatures. Permanent ice is ice that doesn't change states, and remains frozen due to being exposed to cold temperatures.

Almost 90% of the earth's permanent ice is found in Antarctica, while the remaining 10% is found surrounding Greenland. The Antarctic Ice Sheet extends almost 14 million square kilometres! That is 4 million square kilometres larger than the region of Canada!

Gas – Water Vapour in our Environment

Water as a gas is vapour, and it is in the air all around us. We can't see water vapour. When we boil water, we will see water changing from a liquid to a gas. The vapour we "see" is actually the cooling of vapour that is becoming a cloud called steam. This small cloud is just like the clouds we see in the air.

Humidity is the measure of how much water vapour is in the air. A weather report will include the humidity for that day as a percentage. This is called relative humidity. If the relative humidity is 25%, it means the air is 25% saturated (full) of water. It could hold 75% more water, but nothing more.

© Super Simple Sheets

Name: _____ 10

Curriculum Connection
E2.1

Questions

Use information from the text to support your answer.

1) How does water change states in the environment?

2) Where [illegible] found in each of the three states of matter below?

Liqui[illegible]	
Sol[illegible]	
Gas	

PREVIEW

Making Connections

In your loca[illegible]mer[illegible]o you see the three states of water?

True or False

Circle whether the statement is true or false.

1) A solid will turn into a liquid through evaporation.	True	False
2) The removal of heat from liquid water will change it to a gas.	True	False
3) Adding heat to ice will change it to a liquid.	True	False
4) We can see water in its gaseous state.	True	False
5) Humidity tells us how much water vapour is in the air.	True	False

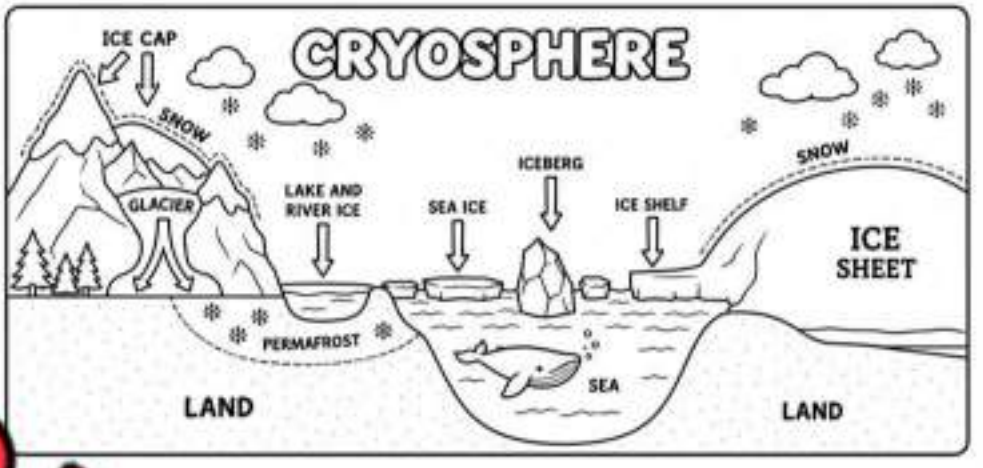
Name: _____ 12

Curriculum Connection
E2.1

Cryosphere - Glaciers

What is the Cryosphere?

The **cryosphere** is the part of the earth's surface that has solid water – ice. The cryosp is made up of regi d the world temper es belo



This is the free g or liqu r. The cryosphere is made up of different forms of glaciers, including i s, ic nd river ice, sea ice, icebergs, and ice shelves.

What are Glaciers?

A **glacier** is a slow moving, large ass o zen over a long period of time.

- Ice Sheet – Ice sheets are the large of gla ts are the size of continents as they must be bigger than 50,00 e kil The only ice sheets on Earth are in Antarctica and Greenland. How ge 20,000 years ago, two ice sheets covered most of the northern pa h A (Canada).
- Ice Cap – Ice caps are smaller than ice sheets, as they are s th kilometres. Most ice caps are found near the north and south po . Canada has the Devon Ice Cap on Devon Island in Nunavut. It covers 12,000 k
- Icebergs – Icebergs are floating pieces of ice that are more than 15 metres long that are found in oceans or lakes. Icebergs are created when they break off a larger glacier. Icebergs are made of freshwater, as they begin their live on land.
- Sea Ice – Sea ice is frozen ocean water; therefore, it is made of saltwater. Sea ice floats on the ocean's surface. It covers about 7% of the earth's surface and 12% of the world's oceans.
- Ice Shelf – Ice shelves are permanent floating sheets of ice that are connected to a landmass. When ice breaks off an ice shelf, it can become an iceberg.

PREVIEW

Name: _____ 13

Curriculum Connection
E2.1

Questions

Use information from the text to support your answer.

1) What is the cryosphere? What is part of the cryosphere?

2) What i[illegible]? [illegible]w are some glaciers formed?

PREVIEW

Order

Put the glaciers below in [illegible]om s[illegible]t (1) to largest (6).

Iceberg	Ice Cap	Ice Sheet	[illegible]elf	[illegible]	Lake/River Ice

Multiple Choice

Circle the best answer.

1) The largest glacier is an	Ice cap	Ice sheet
2) An ice sheet must be larger than	100,000 km^2	50,000 km^2
3) A glacier that is smaller and is made of freshwater	Sea Ice	Iceberg
4) The regions in our cryosphere must be below	0°C	-5°C
5) Sea Ice is made of	Freshwater	Saltwater
6) Which glacier is attached to a landmass?	Ice Shelf	River Ice
7) Glaciers are...	Moving	Still

© Super Simple Sheets

Name: _____ 16

Curriculum Connection
E2.1

The Sun and The Water Cycle

The Sun and The Water Cycle

All living things on Earth need water to survive. Water is not made in nature; it is recycled through the water cycle. The Sun's heat energy drives the water cycle.

Water exists on the Earth in all three of its states, liquid, solid as ice and as water vapour. Water changes easily from one state to another by evaporation, melting, freezing, sublimation, condensation and deposition. Each of these changes requires a transfer of energy.

Evaporation: process of water changing from a liquid into water vapour. It is the most common water moves back into the water cycle.

Melting: solid ice becoming liquid by adding heat.

Freezing: the process coming solid ice by loss of heat.

Sublimation: is om solid ice to water vapour without first becoming liquid. Sublimation by being absorbed.

Condensation: is the process urning into liquid. This happens when the vapour is cooled.

Deposition: is the process where directly into a solid without becoming a liquid first. This happens where temperatures are very low. Another example is frost. Deposition result

The Water Cycle

Melting, evaporation and sublimation happen when heat energy is absorbed. Condensation, freezing and deposition happen when there is a decrease in the heat energy (heat loss) in the water particles.



In the water cycle, water moves from the surface of the Earth into the air and back to the surface of the Earth over and over again. This continued movement of water is only possible because of heat energy from the Sun. Without the Sun's heat energy, water would not evaporate and all water on Earth would freeze.

When water molecules are heated, they exchange freely with the air in a process called evaporation. Ocean water is constantly evaporating, increasing the temperature and humidity of the surrounding air to form rain and storms that are then carried by trade winds. In fact, almost all rain that falls on land starts off in the ocean. The tropics are particularly rainy because heat absorption, and thus ocean evaporation, is highest in this area.

PREVIEW

© Super Simple Sheets

Name: _____ 17

Curriculum Connection
E2.1

True or False

Circle whether the statement is true or false.

1) Melting, evaporation and condensation happen when there is heat loss in the water particles.	True	False
2) The water cycle recycles the same water repeatedly.	True	False
3) Water evaporates and forms clouds, which are moved by winds. This is one way water moves from one place to another.	True	False
4) Deposition is when water is deposited into an ocean.	True	False
5) Most of that falls on land started in the ocean.	True	False

Summ

Su the reading by writing the important information.

Questions

Use information from the text to suppo an

1) What are the 6 processes that change water from one state of m f?

2) How does the heat transfer from the Sun drive the water cycle?

PREVIEW

© Super Simple Sheets

Curriculum Connection
E2.1

Exit Cards

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

Name: _____ Mark

Match each the region to the correct description.

Evaporation	❑ Water vapour changes directly into solid ice
Condensation	❑ Solid ice changes directly into water vapour
Sublimation	❑ Liquid water changes into water vapour
Deposition	❑ Water vapour changes into liquid water

Name: _____ Mark

Match each the region to the correct description.

Evaporation	❑ Water vapour changes directly into solid ice
Condensation	❑ Solid ice changes directly into water vapour
Sublimation	❑ Liquid water changes into water vapour
Deposition	❑ Water vapour changes into liquid water

Name: _____ Mark

Match each the region to the correct description.

Evaporation	❑ Water vapour changes directly into solid ice
Condensation	❑ Solid ice changes directly into water vapour
Sublimation	❑ Liquid water changes into water vapour
Deposition	❑ Water vapour changes into liquid water

PREVIEW

Name: _____ 19

Curriculum Connection
E2.1

Water Cycle Diagram



PREVIEW

Water Cycle Explain how each process below circu ter cycle.

Process	How It Circulates Wate
Precipitation	
Condensation	
Evaporation	
Transpiration	
Infiltration	

© Super Simple Sheets

Name: _____ 20

Curriculum Connection
E2.1

Diagram

Label the parts of the water cycle.

Evaporation	Condensation	Transpiration	Infiltration
Groundwater	Ocean	Stream	Precipitation



PREVIEW

Questions

Answer the questions below.

1) Where are the main areas that water is stored? (note: they are not all i diagram)

2) Where does most of the water get evaporated from?

3) Where are two places that water goes when it pools on top of the soil?

© Super Simple Sheets

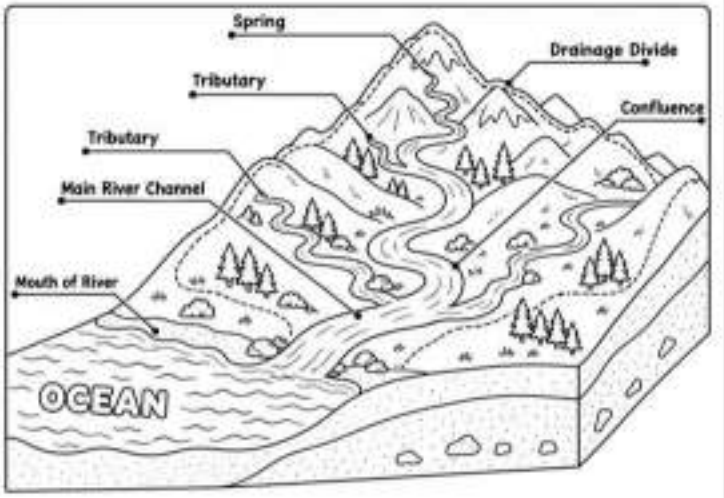
Name: _____ 21

Curriculum Connection
E2.2

Watersheds

What is a Watershed?

A **watershed** is an area of land where surface water drains down into a common set of streams and rivers that all drain into a single larger body of water, such as a larger river, lake, or ocean.



Eve[illegible] lives in a watershed! The water tha[illegible]n your property will either b[illegible] drained down to a com[illegible]or[illegible] When the water reache[illegible] stre[illegible]akes it downward wh[illegible]til[illegible]ches a larger body of [illegible]water[illegible]metimes referred to as a drainage basin.

Watershed Important [illegible]

To understand how the wa[illegible]ined [illegible]houses to a large body of water, it is helpful to understand the ter[illegible]low

Spring – where groundwater returns [illegible]earth'[illegible]e[illegible]rough a natural opening in the Earth's crust

Draining Divide – the line that separates waters[illegible]th[illegible]nd hills or mountains. A neighbouring watershed will have its [illegible]ms, an[illegible]s that could lead to the same large body of water

Confluence – where two flowing bodies of water, like two rivers, [illegible] larger channel.

Tributary – is a stream or a river that flows into a larger river. A tributary does not flow directly into a sea or ocean

Flood Plain – a strip of flat, dry land that is beside a stream, river, or lake that gets covered by water during a flood

Subwatershed – a smaller watershed within the larger system. In the diagram above, if you lived in the mountains, your subwatershed is the small system that drains your water into tributaries.

Estuary – an area that is open to an ocean or sea where one or more rivers or streams meet. We will find brackish water in an estuary.

PREVIEW

Name: _____ 22

Curriculum Connection
E2.2

Questions

Use information from the text to support your answer.

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

2) What is a drainage divide? How do you think gravity affects a drainage divide?

PREVIEW

Making Connections

Do you live near any [illegible] near you? Explain your sub watershed.

True or False

Circle whether the statement is true or false.

1) A drainage divide is usually along hills or mountains.	True	False
2) A confluence is a smaller flowing body of water, like a stream or river.	True	False
3) A tributary is where two confluences meet to form one river.	True	False
4) An estuary is an area open to an ocean where rivers or streams meet.	True	False
5) A flood plain is the flat land beside a stream or river.	True	False

© Super Simple Sheets

Name: _____ 27

Curriculum Connection
E2.2

Importance of Healthy Watersheds

Importance of Healthy Watersheds
Watersheds are important to not only humans, but all living things. A healthy watershed provides many services that humans need that relate to water. Our ecosystems that support plant and animal life need healthy watersheds as well.



PREVIEW

Importanc[illegible]ealthy Watershed – For Humans

- Prov[illegible]rinking water through the i[illegible]s water through floodplains. Th[illegible]cess fi[illegible]ollutants and returns nutrients t[illegible]en [illegible]spend money to protect an[illegible]our w[illegible]d, it has been proven that we [illegible]mo[illegible]ing water treatment facilitie[illegible]
- Stores carbon in the soi[illegible]hel[illegible]enhouse gas emissions
- Increases our ability to deal with c[illegible]hang[illegible]ts, like flooding. When we use reservoirs to control water lev[illegible] we hav[illegible]e p[illegible]tion from climate change threats like drought and flooding.
- Reduced risk of invasive species because our [illegible]ter is designed for the species that have been surviving [illegible]ditio[illegible] many years. The conditions should be too challenging for invasive [illegible]s t[illegible]
- Provides opportunities for hydro electricity, with the moveme[illegible]
- Lower rates of illness and stress are associated with having views [illegible]atershed components.

Importance of a Healthy Watershed – For Plants and Animals

- The movement of water in streams and rivers helps ensure water is spread to soil and plants that need it to survive
- Watersheds have created wetlands, like swamps and marshes that provide thriving ecosystems full of biodiversity
- Watersheds provide filtered, clean water for plants and animals
- They connect ecosystems as streams connect to other streams. This allows animals to have a larger ecosystem to meet their survival needs

© Super Simple Sheets

Name: _____ 28

Curriculum Connection
E2.2

Discuss Fill in the table with point form answers.

How Watersheds Help Humans	How Watersheds Help Plants/Animals

PREVIEW

Inference How do y... wa... ...comes unhealthy?

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

1) Watersheds help store carbon, which reduces greenhouse gases in the air.	T	F
2) Watersheds filter water by removing pollutants.	T	F
3) It is cheaper to not worry about watersheds and build more treatment plants.	T	F
4) Without healthy watersheds, we'd have more floods and worse droughts.	T	F
5) Watersheds can provide renewable energy.	T	F

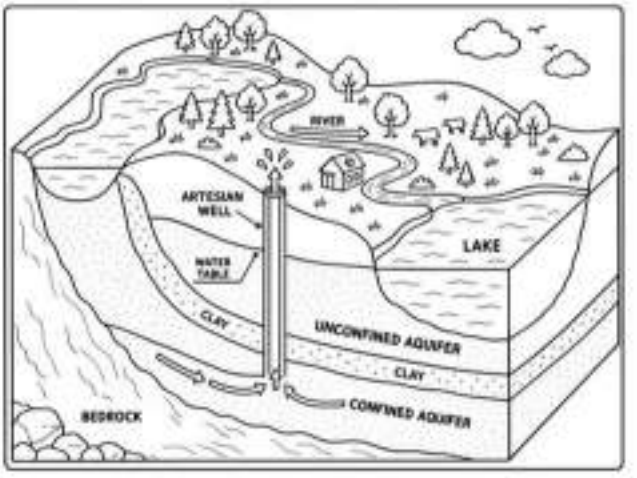
© Super Simple Sheets

Name: _____ 30

Curriculum Connection
E2.3

Water Table and Aquifers

What is the Water Table?



The **water table** is the upper-level underneath the ground that is permanently saturated, or filled, with water. I'm sure you have wondered where the water from puddles and land go. Some of the water is evaporated, but most of it seeps into the soil, joining the groundwater.

The area just below the ground's surface is called the unsaturated zone. It is above the water table. This zone has both water and oxygen between the sediments. The soil we dig down into the ground, you will be digging in this zone and likely won't find water. The water table is typically 4 to 10 metres below the ground.

The amount of water in the water table changes from season to season. During the summer, the water table typically has less water in it, as more water will evaporate and not seep into the ground. During late winter and spring, the water table is fullest, as snow is melting and seeping into the ground.

Aquifers

An **aquifer** is an underground layer of material that contains water. The material could be sand, clay, or gravel. These materials allow water to get between them, which allows them to hold water. The material could also be rock, if the rock has void spaces that water can enter.

Aquifers are like rivers or streams underground that allow the movement of water. Aquifers contain groundwater sources of water that are often accessed by wells for people to get clean water from.

An **unconfined aquifer** has direct contact with the atmosphere. Therefore, unconfined aquifers are found just below the ground level. The water table is considered an unconfined aquifer. A **confined aquifer** is surrounded by many rock and clay materials. It has no exposure to the ground level, as it is found deep underground.

PREVIEW

Name: _____ 31

Curriculum Connection
E2.3

Questions

Use information from the text to support your answer.

1) What is a water table? Where is it found?

2) What is the difference between an unconfined aquifer and a confined aquifer?

PREVIEW

Diagram

Draw a diagram of the water table and aquifers underground.

True or False

Circle whether the statement is true or false.

1) A confined aquifer is right below the Earth's surface.	True	False
2) The water table is easy to access by digging with a shovel.	True	False
3) A well accesses groundwater in the water table.	True	False
4) A confined aquifer is surrounded by rock and clay.	True	False
5) Groundwater is clean and safe to drink from wells.	True	False

© Super Simple Sheets

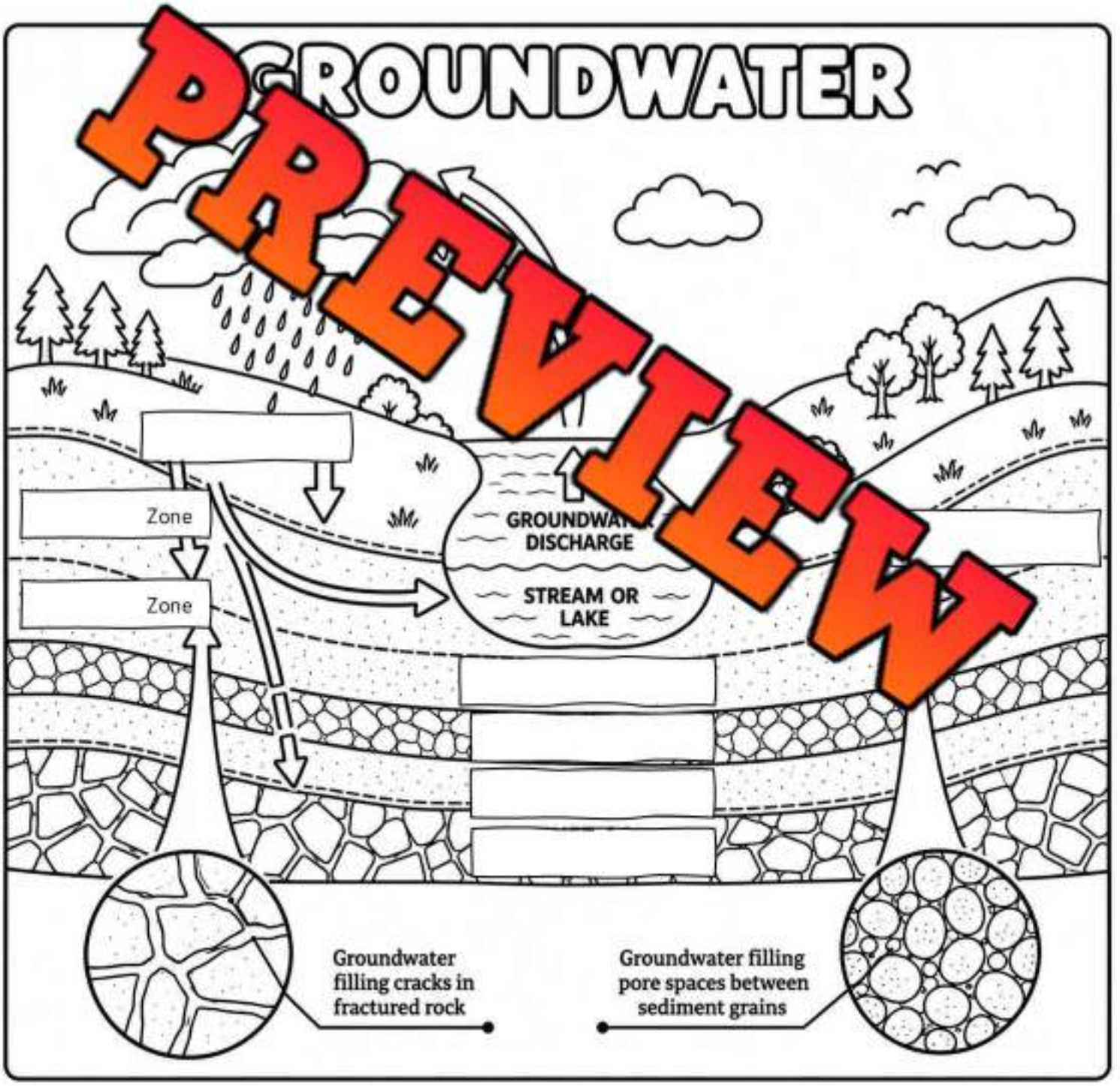
Name: _____ 32

Curriculum Connection
E2.3

Groundwater Diagram

Diagram Label the parts of the groundwater system.

Bedrock	Confining Bed	Confined Aquifer	Unconfined Aquifer
Saturated Zone	Unsaturated Zone	Water Table	Infiltration



PREVIEW

© Super Simple Sheets

Name: _____ 33

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

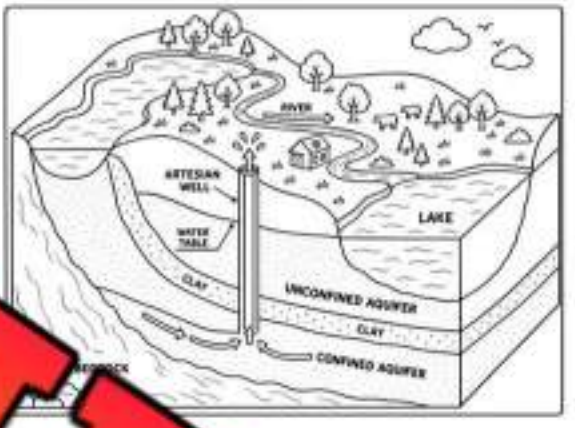
Experiment – Groundwater Model

Research Question — What are we learning more about?

Today, we will be making a model of groundwater that shows water in an aquifer as well as in our water table.

Materials — What do we need?

- ✓ 1 large clear container
- ✓ Sand
- ✓ Gravel
- ✓ Water



Method — How do we complete the experiment?

1) In the glass, layer sand and gravel alternating between the glass is about 3/4 full. This will create an aquifer.

2) Slowly pour water into the glass. Observe how the water makes its way

3) Continue slowly pouring water into the container. Stop about 3 cm below the top of the aquifer. The level of water in the container is the water table. A **water table** describes the boundary between water-saturated ground and unsaturated ground

4) Slowly add a small amount of water to the container to represent rainfall. This demonstrates the recharging of the groundwater.

5) If possible, you could keep this model for days and weeks and observe how the water evaporates (is used) and how it recharges with rain.

PREVIEW

Name: _____ 34

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

Diagram

Draw a diagram below.

Draw the model you have made and label the following – aquifer, groundwater, water table, bedrock

Results

Answer the [illegible] below.

1) Describe what happened when you fi[illegible]ater [illegible] glass.

2) When the aquifer filled with water, did it become saturated [illegible]uns[illegible]

3) What does the glass represent? Is the glass permeable or impermeable?

4) What happens to the water table when it rains?

PREVIEW

© Super Simple Sheets

Name: _____ 40

Curriculum Connection
E1.1, E2.3

Research – Bottled Water Extraction

The bottled water industry earns money from the extraction of groundwater and bottling of that water. Many citizens in the regions these companies extract water from are worried about decreasing ground water levels.

Research a bottled water company and learn more about where they extract their water from. Find out if their extraction of water has led to any protests.



Research and answer the questions below.

PREVIEW

1) Which company did you choose?

2) Where do they extract water from? (country, province, indigenous land, springs or aquifers)

3) How much do they pay for the water they extract?

4) Is there any controversy over the company's use of groundwater? Explain.

Curriculum Connection
E1.1, E2.3

Research Answer the questions below.

5) Has anyone protested the company? How did they protest?

6) What other interesting [illegible] you've [illegible] out this company's use of groundwater?

PREVIEW

© Super Simple Sheets

Name: _____ 42

Curriculum Connection
E1.1, E2.4

Climate Change – Melting Glaciers

Climate Change - Background

Scientific evidence has shown that our climate has warmed over the last 100 years due to human activity. The everyday actions of our society are creating greenhouse gases that are wrapping a thick blanket around our planet.

The burning of fossil fuels to generate energy is the primary reason for climate change. Since the Industrial Revolution, our society has relied on fuel burning machines to power our technologies. When fossil fuels are burned, the result is carbon dioxide emissions, also called greenhouse gases. These emissions rise into our atmosphere and disrupt the carbon cycle.

Global Warming

The term **global warming** refers to the long-term heating of the Earth's climate system. Scientists have observed that human activities since the pre-industrial period (1850-1900) have increased average temperature by about 1 degree Celsius. This number is increasing by 0.2 degrees per decade. At this rate, you can see that we are warming the planet at an unsustainable rate.

2020	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000
±0	+1.6	3.6	5.6	7.6	9.6	11.6	13.6	15.6	17.6	19.6

Melting Glaciers

As a result of human activities causing global warming, glaciers are melting. The **Muir Glacier** in Alaska has retreated and thinned since the 19th century. The images show the state of the glaciers in 1941, and 2004. The glacier has moved back about 11 kilometres and has decreased in thickness by more than 800 metres.



The ice sheets on Greenland and Antarctica are melting at a rapid rate. In Greenland, the ice sheet's mass has shed an average of 279 billion metric tons of ice per year. All of this ice is entering the Arctic ocean causing sea level rises. In Antarctica, every 40 hours, one billion metric tons of ice is melted. In total, the Earth is now losing 1.2 trillion tons of ice each year.

The effects of melting glaciers on our land is causing concern over rising see levels. If all glaciers were to melt, the water levels would rise a whopping 70 metres! This would put every coastal city underwater. Fortunately, it is not likely that all glaciers would ever melt, but we are heading in the wrong direction.

PREVIEW

Name: _____ 43

Curriculum Connection
E1.1, E2.4

Questions Use information from the text to support your answer.

1) Define the terms below.	
Industrial Revolution	
Global Warming	

2) How mu[illegible] is the Earth warming each year? Why is this unsustainable?

Reaction What is your [illegible] the [illegible]laciers? Explain what you're thinking.

PREVIEW

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

1) The Earth is warming 1 degree Celsius every 100 years.	True	False
2) The Muir Glacier has melted to the point it has retreated 11 kilometres.	True	False
3) Each year, 1.2 trillion tons of glacier ice is melting.	True	False
4) The ice caps in Antarctica and Greenland are melting rapidly.	True	False
5) If all glaciers melt, the sea levels will rise 100 metres causing flooding.	True	False

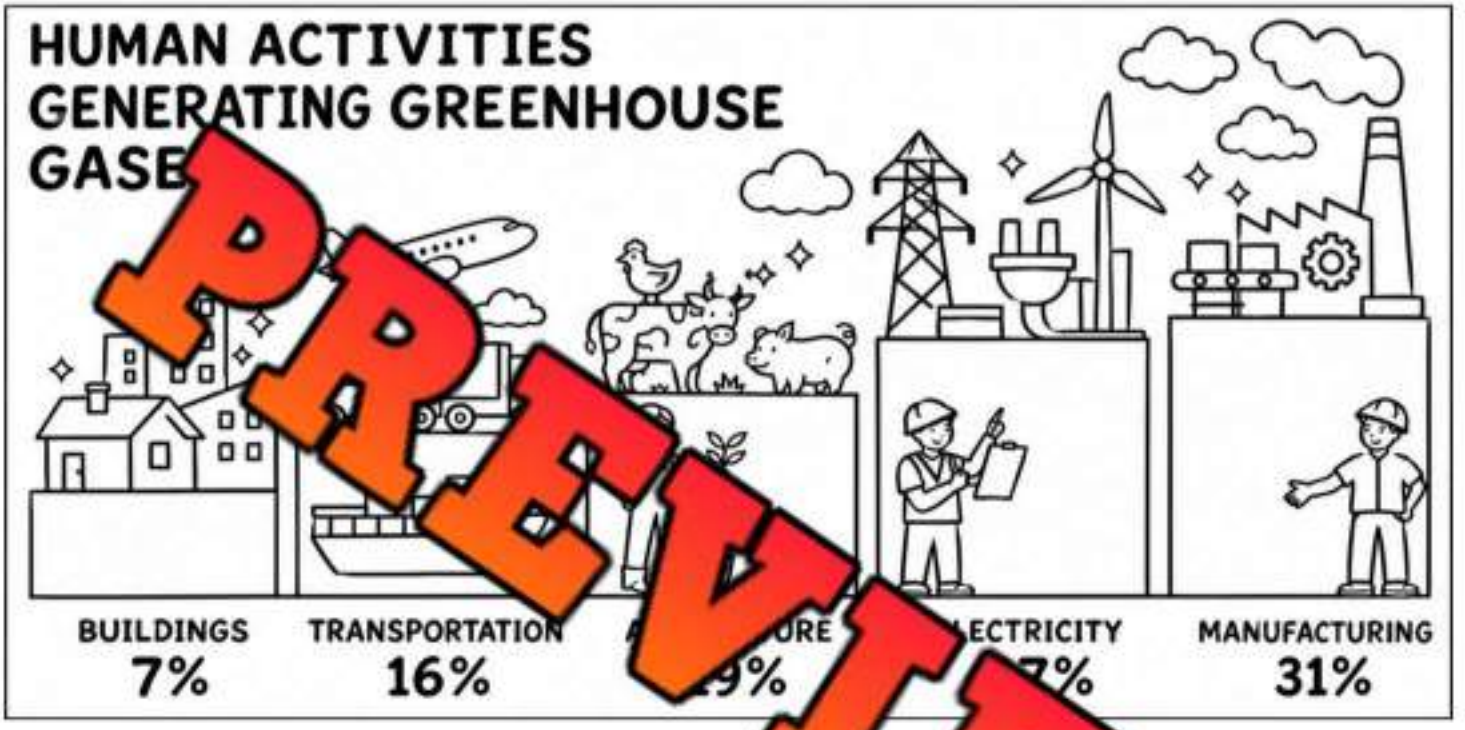
© Super Simple Sheets

Name: _____ 44

Curriculum Connection
E1.1, E2.4

Human Activities – Greenhouse Gases

The infographic below shows which human activities are polluting our atmosphere, causing global warming.



PREVIEW

Research How do the human activities crea… g… e gas… Explain below.

Buildings	
Transportation	
Agriculture	
Electricity	
Manufacturing	

© Super Simple Sheets

Name: _____ 45

Curriculum Connection
E1.1, E2.4

Effects of Melting Glaciers

Background – Why Are Glaciers Melting?

Glaciers are melting for two main reasons. First, the increase in temperatures due to global warming are melting glaciers at a rate much faster than they were melting before the industrial revolution. This fact tells us that our human actions are causing glaciers to melt.

The second reason is due to warming ocean temperatures. With the temperatures rising, the ocean's temperatures are rising also. This is causing melting of glaciers under the surface of the ocean. Scientists are concerned that the global ocean currents are changing warmer ocean waters to be pushed towards the north and south poles. This is melting the very important ice in Antarctica and Greenland.



PREVIEW

Effects of Melting Glaciers

🌊 Rising Sea Levels

Since 1961, glacial melting has caused sea levels to rise 2.7 centimetres.

🟠 Impact on the Climate

As glaciers are melting at the north and south poles, the oceanic currents are slowing, causing a changing global climate and creating extreme weather events, like hurricanes and typhoons.

🐧 Disappearance of Species

Glacier melting is causing the extinction of many species. Glaciers provide a natural habitat to many animals, including penguins, seals, and polar bears. Almost all penguins are found in Antarctica, where they live on glaciers. Icebergs provide habitats for these animals to take a rest as they travel around their ecosystem. Without these glaciers, many of these animals will become extinct.



💧 Less Freshwater

Melting glaciers help supply the river systems on our Earth. Scientist believe that by the year 2100, 85% to 100% of all arctic ice in Canada will be lost. This means the supply of freshwater into the rivers in Canada will be affected greatly. These regions that are currently being supplied with freshwater from melting glaciers will need to adapt to life with less freshwater available.

Name: _____ 46

Curriculum Connection
E1.1, E2.4

Questions
Use information from the text to support your answer.

1) Why are glaciers melting?

2) Why wil[illegible]e animals become extinct if glaciers continue to melt?

PREVIEW

Summarize
Paraphras[illegible]adi[illegible]one sentence.

Rising Sea Levels	
Impact on Climate	
Disappearance of Species	
Less Freshwater	

Questioning
Write 2 questions you have about the reading.

1)	
2)	

© Super Simple Sheets

Name: _____ 47

Curriculum Connection
E1.1, E2.4

Assignment – Melting Glaciers Infographic

Create an infographic that displays the issues with melting glaciers. Your infographic could focus on one or two of the aspects below or all three.

- Human activities causing melting glaciers
- How much ice is melting?
- Effects of melting glaciers



Your infographic needs statistics and illustrations that represent the problem.

PREVIEW

Research statistics by answering the questions below.

1) What human activities are causing the melting of glaciers? Find statistics about global warming and what is causing it.

2) How much ice is melting? Find statistics to show why the problem is

Curriculum Connection
E1.1, E2.4

3) What are the effects of the melting glaciers? Find statistics that explain how melting glaciers will cause problems.

4) What pictures w dra tics you decide to use. Practice drawing these pictures, or if you are write ideas for pictures you could look for. Also, practice the text you ing.

PREVIEW

Name: _____ 49

Activities – Glaciers and Climate Change

Word Search Find the words from the word bank.



Ice	Cap	Shelf	Iceberg	Sea
Fossil	Fuels	Carbon	Emissions	Cryosphere
Glacie	Melting	Freshwater	Climate	Change

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

PREVIEW

Word Scramble Unscramble the words from the word bank.



IFOSSL		BERECGI	
HESCEORPYR		ABCORN	
HEARSTWRFE		ENGILTM	
ELHSF		AELIGRC	
SEOINSISM		ULFSE	

© Super Simple Sheets

Name: _____ 50

Curriculum Connection
E2.5

Bodies of Water

What are Bodies of Water?
A **body of water** is any significant accumulation of water on the surface of the Earth. Examples of bodies of water are oceans, seas, wetlands, deltas, lakes, ponds, and rivers.

Oceans
An **ocean** is a large body of salt water that fills a massive basin on the Earth's surface. We have one global ocean that are often divided into 5 smaller oceans. The five oceans are the Atlantic, Pacific, Indian, Arctic, and Southern. Oceans are the largest body of water. The global ocean covers 71% of the Earth's surface. The average depth of the global ocean is 3,688 metres!



Lakes
A **lake** is a large body of water that is surrounded entirely by land. Lakes drain into an ocean or river, and are not connected to the ocean. The Great Lakes are open lakes as some of their water flows out to the ocean, as they all drain into the St. Lawrence River.

Seas
A **sea** is a smaller part of an ocean that is partially contained by an area of land. This means that all seas are found in areas where the ocean meets the land. There are 23 seas in the world, including the Mediterranean Sea and Black Sea. Seas are full of saltwater.

Wetlands
A **wetland** is a low-lying area of land that is covered with water permanently or seasonally. Examples of wetlands are swamps, marshes, and bogs. Wetlands have grasses, trees, shrubs and mosses as well as aquatic plants like water lilies and cattails. A swamp is a wetland that has trees, while a marsh is a wetland with no trees.

Pond
A **pond** is a small body of water, less than 11 acres in size. They are often man-made. Ponds may become wetlands over time if plants begin to grow throughout the pond.

Deltas
A **delta** is a body of water that forms when a river splits and spreads out into several branches before entering a sea or ocean. The Fraser River delta is in British Columbia, where the Fraser River drains into the Strait of Georgia, and eventually into the Pacific Ocean. In the delta, the mixing of freshwater and saltwater produces brackish water.

Rivers
A **river** is a large stream of water that flows downhill into another body of water, like an ocean, sea, or lake. The St. Lawrence River flows downhill towards the Atlantic Ocean.

PREVIEW

Name: _____ 51

Curriculum Connection
E2.5

Definitions

What are each of the bodies of water?

Oceans	
Lakes	
Rivers	
[illegible]	
Wetlands	
Ponds	
Deltas	

PREVIEW

Questions

Use information from the text to support your answe[illegible]

1) What is a body of water? Do you live near any bodies of water?

2) What is the difference between an ocean and a sea?

© Super Simple Sheets

Curriculum Connection
E2.5

Exit Cards

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

Name: _____ Mark

Fill in the blank space.

1) An _____ is the largest type of body of water.

2) A _____ is surrounded entirely by land.

3) A _____ is a low-lying area covered with water permanently or seasonally.

4) A river that splits and spreads into branches can form a _____.

5) A _____ is a large stream of water that flows downhill.

Name: _____ Mark

Fill in the blank space.

1) An _____ is the largest type of body of water.

2) A _____ is surrounded entirely by land.

3) A _____ is a low-lying area covered with water permanently or seasonally.

4) A river that splits and spreads into branches can form a _____.

5) A _____ is a large stream of water that flows downhill.

PREVIEW

Name: _____ Mark

Fill in the blank space.

1) An _____ is the largest type of body of water.

2) A _____ is surrounded entirely by land.

3) A _____ is a low-lying area covered with water permanently or seasonally.

4) A river that splits and spreads into branches can form a _____.

5) A _____ is a large stream of water that flows downhill.

Name: _____ Mark

Fill in the blank space.

1) An _____ is the largest type of body of water.

2) A _____ is surrounded entirely by land.

3) A _____ is a low-lying area covered with water permanently or seasonally.

4) A river that splits and spreads into branches can form a _____.

5) A _____ is a large stream of water that flows downhill.

© Super Simple Sheets

Bodies of Water - Temperatures

How Bodies of Water Affect Temperatures



If you live near a large body of water, you will experience different temperatures as a result. The reason for this is because the temperature of the water in oceans and large lakes takes longer to change than the air temperature. Therefore, the temperature further inland will only be affected by the air temperature, but the temperatures on the coast are affected by both the body of water and the air temperature. Living on the coast means you will experience moderate temperatures, without experiencing the extreme heat or cold.

Why Does This Happen?

Seasons

Water stores heat more than most other substances. Water needs 4 and a half times more heat energy than air needs to change its temperature. This means that as the seasons change, oceans and large lakes takes 4 and a half times longer to warm up than the land does. This results in less dramatic temperature changes.

During the winter, large bodies of water release the heat they gained over the summer. This heat contributes to warmer winters by. During the summer, the large lakes and oceans are absorbing heat which makes less heat available for the coastal region. The cooler bodies of water produce cooler winds which prevents extreme heat in the summer.

Ocean Currents

An **ocean current** is the movement of water from one area to another. Ocean currents take warm water and heat from the tropical regions and send them to the North and South poles. As the warmer water moves north and south, it warms the cooler regions.

Comparing Coastal Cities and Inland Cities

Winnipeg vs Vancouver

Both Winnipeg and Vancouver have a latitude of 49 degrees North, meaning they are both the same distance from the equator. However, Vancouver is along the west coast of Canada, along the Pacific Ocean. Winnipeg is in Manitoba, so it is inland from any oceans.

Check out the average high temperatures for August and February in both cities. You can see that Winnipeg has a warmer summer and a much colder winter. Vancouver has less extreme temperatures because the Pacific Ocean cools the land in the summer and releases heat in the winter.



	August	February
Vancouver	23°C	8°C
Winnipeg	25°C	-9°C



PREVIEW

Name: _____ 54

Curriculum Connection
E2.5

Questions

Use information from the text to support your answer.

1) During the winter, if you live along the coast of a large body of water, will the temperature be warmer or colder than a city further inland? Explain.

2) Dur[illegible] you live along the coast of a large body of water, will the temp[illegible] older than a city further inland? Explain.

3) How do large bodies of water affect [illegible]perat[illegible] earby cities?

PREVIEW

True or False

Circle whether the statement is true or false.

1) Vancouver is warmer all year than Winnipeg is.	True	False
2) Winnipeg has colder winters than Vancouver because they are further inland.	True	False
3) Coastal cities experience more extreme temperatures – very hot and cold.	True	False
4) Inland cities experience more moderate temperatures, less changes.	True	False
5) Ocean currents move warm water from the tropics to the poles.	True	False

© Super Simple Sheets

Name: _____ 57

Curriculum Connection
E2.5

Research – Coastal Cities vs Inland Cities

Cities that are at the same latitude will experience the same exposure to the sun's solar energy. However, there are other factors that affect the temperatures of a city, like whether it is on the coast or inland.

Compare the inland cities versus the coastal cities. Three Canadian pairs of cities with similar latitudes have been provided for you. Find 1 more pair of cities that have a similar latitude to compare as well. Use the high temperature for the data you find.

Research ... in the table below to compare the temperatures of each city.

Posi...	...	January	April	July	October
Coastal	...otia				
Inland	Sudbu...				

Position	City	J...		July	October
Coastal	St. John's				
Inland	Lethbridge				

Position	City	January	April	...	...ctober
Coastal	Sault Ste. Marie				
Inland	Timmins				

Position	City	January	April	July	October
Coastal					
Inland					

PREVIEW

Name: _____ 58

Curriculum Connection
E2.5

Results Describe the relationships you discovered from your data collection.

1) Nova Scotia and Sudbury

2) St[illegible]

3) Sault Ste. Marie and Timmins

4) Your choices

PREVIEW

Name: _____ 59

Curriculum Connection
E2.5

Microclimate – Victoria, BC

What is a Microclimate?
A **microclimate** has different atmospheric conditions than those in its surrounding area. **Atmospheric conditions** refer to temperature, wind, and precipitation. A microclimate means that your area could experience warmer or colder temperatures along with more or less wind and rain than all of the other areas in your region.

Why Do Microclimates Exist?
Microclimates can be caused by any of the following regions:

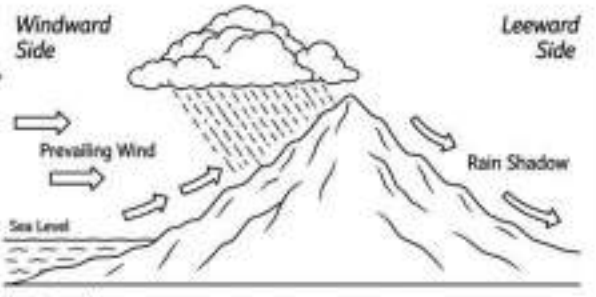
- Mountain regions – living at higher altitudes can have colder temperatures and more
- Coastal regions – bodies of water create moderate temperatures
- Urban regions – cities have warmer temperatures, less wind due to the wind being blocked by buildings, more rainy days

Microclimate – Victoria, BC
Victoria is the warmest area in Canada. It has the most mild climate of all of Canada, despite its latitude being 6° north of the southern part of Canada. Victoria is on an island, on the west coast of Canada. Therefore, Victoria is a coastal region microclimate, as its climate is much different than the cities of its neighbouring cities.

Winds in Victoria
With Victoria being on an island, it is very windy. The average wind speed in Victoria is 10kph. The average wind speed in the neighbouring areas is only 6.2kph. Therefore, the wind in Victoria is significantly different than its neighbouring cities, which contributes to its microclimate.

Temperature in Victoria
The average high temperature in Victoria in July is only 19°C, while the high in Abbotsford is 25°C. That is a massive difference considering these areas are only 100km apart and have similar latitudes. In January, Victoria's average high temperature is 8°C. In Abbotsford, the high temperature in January is 6°C. Abbotsford still benefits from being close to the Pacific Ocean as its winters are more mild than the rest of Canada. However, a 2° C difference is still very significant.

Precipitation
Victoria has an average yearly rainfall of only 58.3cm. In Abbotsford, the average yearly rainfall is a whopping 153.8cm! Victoria does not receive as much rain because it is protected by a rain shadow from the Vancouver Island mountains to the northwest. The rainfall coming from the Pacific tends to get blocked by the mountains, causing less rain to reach Victoria.



PREVIEW

Name: _____ 60

Curriculum Connection
E2.5

Questions

Use information from the text to support your answer.

1) Why is Victoria considered a microclimate?

2) Why do[illegible]a receive less rain than neighbouring cities, like Abbotsford?

PREVIEW

Describe

Describe the microcli[illegible]te of [illegible]y[illegible]ining its atmospheric conditions.

True or False

Circle whether the statement is true or false.

1) Atmospheric conditions include temperature, wind, and precipitation.	True	False
2) Victoria has warmer summers and winters than neighbouring cities.	True	False
3) Victoria receives a lot of snow in the winter.	True	False
4) Victoria has a mild climate, meaning the temperatures don't get too high or low.	True	False
5) Victoria is a coastal microclimate that is also affected by mountains.	True	False

© Super Simple Sheets

Name: _____ 61

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

Activity – Finding a Microclimate

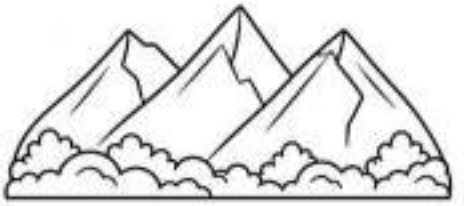
Research Question — What are we learning more about?

A **microclimate** is the climate of a small area, compared to the larger area it exists within. Microclimates have different atmospheric conditions (wind, temperatures, precipitation) compared to the area surrounding it. Examples include caves, the sides of mountains, an oasis in a desert, and even urban areas that trap heat.

Today we will look for a microclimate on your school property. You'll want to find an area that experiences different wind patterns, temperatures, and precipitation.

Materials — What do we need?

- ✓ Thermometer
- ✓ Clipboard
- ✓ Soil thermometer/moisture meter (optional)
- ✓ An anemometer (wind speed meter). You can make one by completing the experiment on the next page – optional





Method — How do we complete the experiment?

1) Have students work in small groups. Let them try to discover microclimates on school property.

2) Students should use their tools (thermometer, anemometer) to gather data about their microclimate. If their data is different from the surrounding area, they may have found a microclimate. If students do not have any tools, they can use their senses to describe the wind and temperature.

3) Students will also need to write down what lives in the microclimate – tall trees, shrubs, flowers, grubs, spiders, squirrels, etc.

4) Share your findings with the rest of the class. Decide if this is a microclimate or not.

PREVIEW

Name: _____ 62

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

Observations Investigate 2 different locations

Location	Temperature	Wind	Precipitation	What Lives Here

PREVIEW

Results Answer the questions below.

1) What is a microclimate?

2) Did you find a microclimate? Explain why one of the locations was or wasn't a microclimate.

© Super Simple Sheets

Name: _____ 63

Curriculum Connection
E2.5

Coastal Storms

What is a Coastal Storm?

A **coastal storm** is a change in atmospheric conditions that create strong winds, heavy rain or snow and sometimes thunder and lightning. Coastal storms are also called tropical storms. These storms form in the vast oceans and then move towards landmasses, often causing massive destruction.

Types of Coastal Storms

There are three main types of coastal or tropical storms – hurricanes, cyclones, and typhoons. These storms are all the same, as they all form over warm ocean waters, rotate around a low pressure, and have wind speeds of over 119 km per hour. We have different names depending on where the storm happens.

PREVIEW

Hurricane

A hurricane will form over the Atlantic Ocean and Northeast Pacific.

Cyclone

A cyclone will form over the Pacific Ocean and Indian Ocean.

Typhoon

A typhoon is formed over the Northwest Pacific Ocean.



How Coastal Storms Form

A coastal or tropical storm will form in the following steps:

1) The water needs to be warm, at least 26.5 degrees Celsius. This is why tropical storms begin in warmer areas near the equator.
2) When wind blows across the warm ocean water, the warm, moist air rises rapidly
3) As it rises, the moist air cools and the water in it condenses, forming large storm clouds
4) The cooling water also releases a lot of heat. This heat transfer creates enough energy to cause strong winds
5) The strong winds push even more air up from the ocean's surface causing more clouds and even more wind
6) The rapidly moving air creates an area of low air pressure in the centre. This middle part of the storm is called the eye of the storm. It is calm, but around the eye has the strongest, most devastating winds.

© Super Simple Sheets

Name: _____ 64

Curriculum Connection
E2.5

Questions

Use information from the text to support your answer.

1) What is a coastal storm? What wind speeds need to be exceeded to be considered a coastal or tropical storm?

2) What is [illegible]ference between a hurricane, cyclone, and typhoon?

PREVIEW

Label

Fill in the blanks [illegible]ch [illegible] of coastal storms form.



Ordering

Order the steps from first to last in the development of a coastal storm.

	The eye of the storm is formed.
	The moist air cools, creating large storm clouds.
	Water is warmed to a minimum of 26.5 degrees Celsius.
	Strong winds are created by warm and cool air moving causing changes in air pressure.
	Wind blows across the warm ocean water causing the moist air to rise.

© Super Simple Sheets

Name: _____ 68

Curriculum Connection
E2.5

Research – Costal Storm

Choose one of the historic coastal storms below to learn more about. Research the cause of the storm and the effects the storm had on the communities it struck.

Examples:

- Hurricane Katrina, Hurricane Harvey, Hurricane Maria, Hurricane Irma, Hurricane Wilma
- Bangladesh Cyclone of 1942, Cyclone Nargis (Myanmar, 2008)
- The Ha[illegible]g Typhoon, Typhoon Nina, Typhoon Haiyan

Resea[illegible] questions below.

1) Which Coast[illegible]ou[illegible]se to research?

2) What year was the storm

3) What category of storm was it?

4) What was the death toll of the storm?

5) How much destruction did the storm cause? How much money was needed for repair?

6) How many buildings were destroyed by the storm? How many people were left homeless?

PREVIEW

Curriculum Connection
E2.5

Research | Answer the questions below.

7) What caused the storm?

8) What types of [illegible] occurred?

9) What other interesting facts did you learn about this [illegible]?

PREVIEW

Name: _____ 70

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

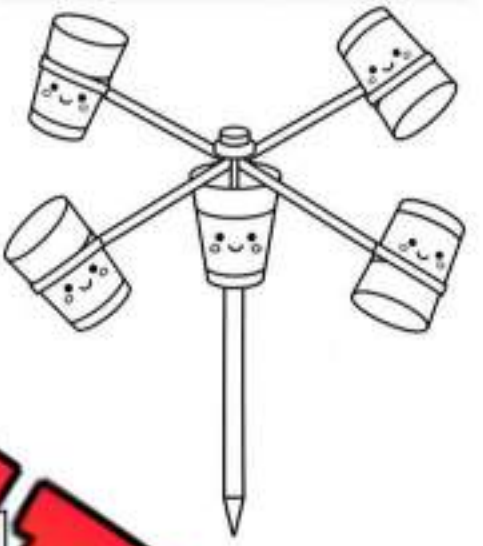
Experiment – Making an Anemometer

Research Question — What are we learning more about?

An **anemometer** is used to measure wind speed. It works by determining how many revolutions per minute (RPM) the tool makes. In other words, it is how many times the anemometer spins in a full circle in one minute.

Materials — What do we need?

- ✓ paper
- ✓ 2 so straw
- ✓ 1 pin
- ✓ A paper pun
- ✓ Scissors
- ✓ Stapler
- ✓ Sharp pencil with an er e
- ✓ A fan with 3 different speed s tes



PREVIEW

Method — How do we complete the experi

1) Take four of the paper cups and punch a hole in o each ups, about a 2 cm below the rim
2) Take one of the paper cups and put one of the straws thro gh i of the straw inside the cup and staple it to the opposite side of th e cup. This will secure the straw to the cup. Repeat this process with the ot aw using just one other cup.
3) Using the fifth cup, punch four equally spaced holes in the sides of the cup, about 2 cm below the rim. Then punch a hole in the centre of the bottom of the cup
4) Take one of your cups with the straw through it and put the straw through the fifth cup. Attach one of the 2 remaining cups to the end by bending the straw inside the cup and stapling it. Repeat this step with the other cups.
5) Make sure your cups are all aligned, so that they open facing the same direction
6) Push the eraser end of the pencil through the bottom hole of the fifth cup.
7) Push the pin down through the two intersecting straws into the eraser. Do not push too far or the anemometer won't spin well due to friction

© Super Simple Sheets

Name: _____ 71

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

Observations | Test your anemometer

1) Now that your anemometer is ready, it is time to test it. Turn the fan on low and stand back about 6-8 steps

2) Use a marker to draw something on one of the cups. This will make it easier to count that cup spinning.

3) Hold the anemometer up and count how many times it spins around fully in one minute. If it moves too fast back up from the fan.

4) Repe[illegible]h of the different fan speeds and record the wind's RPM

	RPM – 1st [illegible]ng	RPM – 2nd Reading	RPM – 3rd Reading	Average
Low				
Medium				
High				

PREVIEW

Results | Answer the questions below.



1) What is an anemometer?

2) What did you notice about the wind speed and the fan speed?

3) When would it be helpful to know the wind speed?

Name: _____ 72

Curriculum Connection
E1.1, E2.6

Water Quality

What is Water Quality?
Water quality is how suitable water is for an intended purpose. This purpose could be for survival of different aquatic species, or it could be for human consumption. As we make sure aquatic ecosystems have quality water, we also help ensure water is safe for human use too. Below are 5 indicators that are measured to understand water quality.

Temperature and Dissolved Oxygen
The water temperature in an ecosystem is one of the most important factors. For optimal health, aquatic organisms need the water temperature to be within their optimal range. Therefore, when temperatures change due to human activities, the organisms that have lived there may be stressed to the point of death.
Water temperature affects the amount of dissolved oxygen (DO) the water can hold. As water temperature rises, the amount of DO decreases. Aquatic organisms need the oxygen that is dissolved in the water to allow them to breathe.

pH Levels
The pH is a measurement of how acidic water is. A pH of 7 is neutral, a pH of 14 is basic, and a pH of 1 is acidic. Quality streams range between 6.0 and 8.5. If the pH values go outside of the range of 4.5 and 9, the water is not optimal for aquatic organisms. The pH can be changed when chemicals are added to water through farming practices like using pesticides.



Nutrients and Minerals
Water should have nutrients available for living organisms to consume. Nitrogen and phosphorous are the two most important nutrients, as they are often in short supply and are needed by plants, algae, and microbes. Other nutrients like iron, manganese, and calcium are needed as well. When humans perform some activities, we change the amount of nutrients in the water. For example, when we use fertilizers high in nitrogen and phosphorous, these nutrients can get into the water, causing too much growth of algae. This changes the balance in the aquatic ecosystem, and can lead to unsafe, low quality water.

Bacteria
Water quality is complex because not all bacteria is bad. However, a common form of bacteria that exists in water is fecal matter. When fecal matter is in our drinking water, it can lead to cholera, and other diarrheal diseases. We can test how much fecal matter is in water by checking its E.coli levels.

Turbidity
The measurement of turbidity level tells us how clean water is and its clarity. Turbidity measures how many suspended solids there are in the water. Some water might be cloudy, indicating that there could be particles like sand, gravel, silt, clay, algae or organic matter from animals, plants, and algae.



PREVIEW

Name: _____ 73

Curriculum Connection
E1.1, E2.6

Summarize What do the indicators of water quality mean?

Temperature and DO	
pH Levels	
Nutri… M…	
Bacteria	
Turbidity	

PREVIEW

Questions Use information from the text t… …

1) Why do you think not all water tastes the same? Why migh… …at b…

2) Why might the pH levels in a stream be too acidic or basic? Why is that a problem?

© Super Simple Sheets

Name: _____ 74

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

Experiment – Testing pH Levels

Research Question What will the pH levels be in puddles, or local streams and rivers?

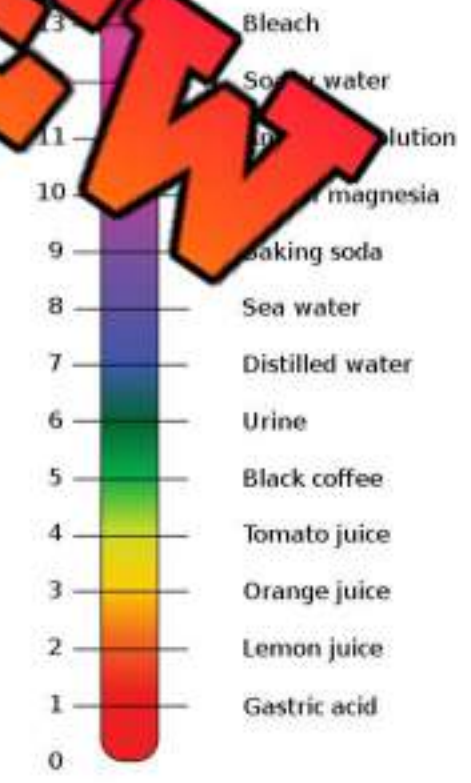
Ma… …ll you need for the experiment?

- ❑ A bottle or c… …lect w…
- ❑ pH strips - can be … …s or pool stores
- ❑ This paper to track your…
- ❑ Pencil to record results



Method How will you complete the ex… …nt?

1) Find local water sources nearby your school. For each source, collect water into your bottle or cup
2) Follow the instructions for the pH strips. Usually, you will saturate the strip with water and compare the colour to the colour guide they provide
3) Write the pH level result you found for the ecosystem you were measuring
4) Describe the ecosystem. Write down any factors that might influence the pH level in that area. Examples – farm or auto shop nearby, loose soil, other pollutants
5) Answer the remainder of the questions on the back of this page



PREVIEW

© Super Simple Sheets

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

Observations What did you notice as you completed the experiment?

1) What is the first source of water you tested? Describe the source (puddle, stream, etc.)

2) What was the pH of this water source?

3) What ar[illegible]e water source could impact the pH level?

1) What is the secon[illegible]rce [illegible]ted? Describe the source.

2) What was the pH of this water [illegible]urce

3) What around the water source could impact [illegible]evel

1) What is the third source of water you tested? Describe the source.

2) What was the pH of this water source?

3) What around the water source could impact the pH level?

PREVIEW

© Super Simple Sheets

Name: _____ 76

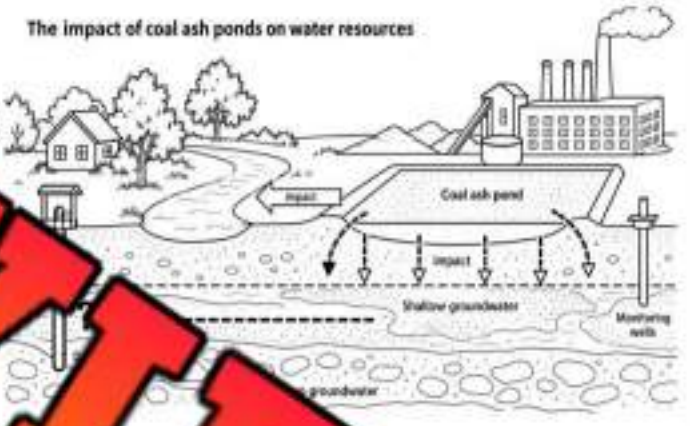
Curriculum Connection
E1.1, E2.6

Human Activities Affecting Water Quality

Human Activities Affecting Water Quality
Having access to clean, drinkable water is essential to human life. Unfortunately, many human activities are threatening the availability of clean drinking water in many of the world's major cities. Below are 5 ways humans are causing water pollution.

1) Agriculture
To improve crop yields, farmers use fertilizers and manure to improve the soil quality. By doing so, the groundwater becomes polluted by the excess nitrates that seep down out of the fertilizer into the groundwater. Too high a concentration of nitrates in our drinking water can cause certain kinds of cancers, as well as birth defects.

2) Fossil Fuel Production
The burning of fossil fuels does not cause global warming, but it does affect our drinking water. When we burn coal for energy, the waste product is coal ash. Coal ash contains toxic chemicals and it is often stored in unlined ponds next to groundwater. When it rains, the ash can leach into the groundwater. Coal ash ponds are adding dangerous pollutants to our water.



3) Sewage
Population growth in urban areas can lead to overloaded sewage treatment plants. In Gauteng, South Africa, the rapid population growth has caused the wastewater treatment plant to work at 200% capacity. This is causing sewage to back up and spill into surrounding fields, which is causing leaching into surface and groundwater.

4) Pharmaceuticals
In Canada, doctors prescribe antibiotics and narcotics to help their patients. Unfortunately, these pharmaceuticals do not disappear when they are consumed. Instead, when someone who is heavily medicated urinates, many of the excess chemicals that are not absorbed by the body end up back in our water systems. In addition, when we discard pills improperly, they end up in landfills and can leach into the water. Our wastewater treatment plants are not equipped to remove traces of these chemicals from our water.



5) Development
The development of our cities, from rural to urban is part of the problem as well. A city with a high population density creates more pollution. Also, the removal of ecosystems to build cities destroys important wetlands that help keep our water clean naturally.

PREVIEW

Name: _____ 77

Curriculum Connection
E1.1, E2.6

Questions Use information from the text to support your answer.

1) How do agricultural practices affect our water quality?

2) How do [illegible]euticals affect our water quality? Why might this be a newer problem?

PREVIEW

Overpopulation How is overpopulatio[illegible]eading to poorer water quality?

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

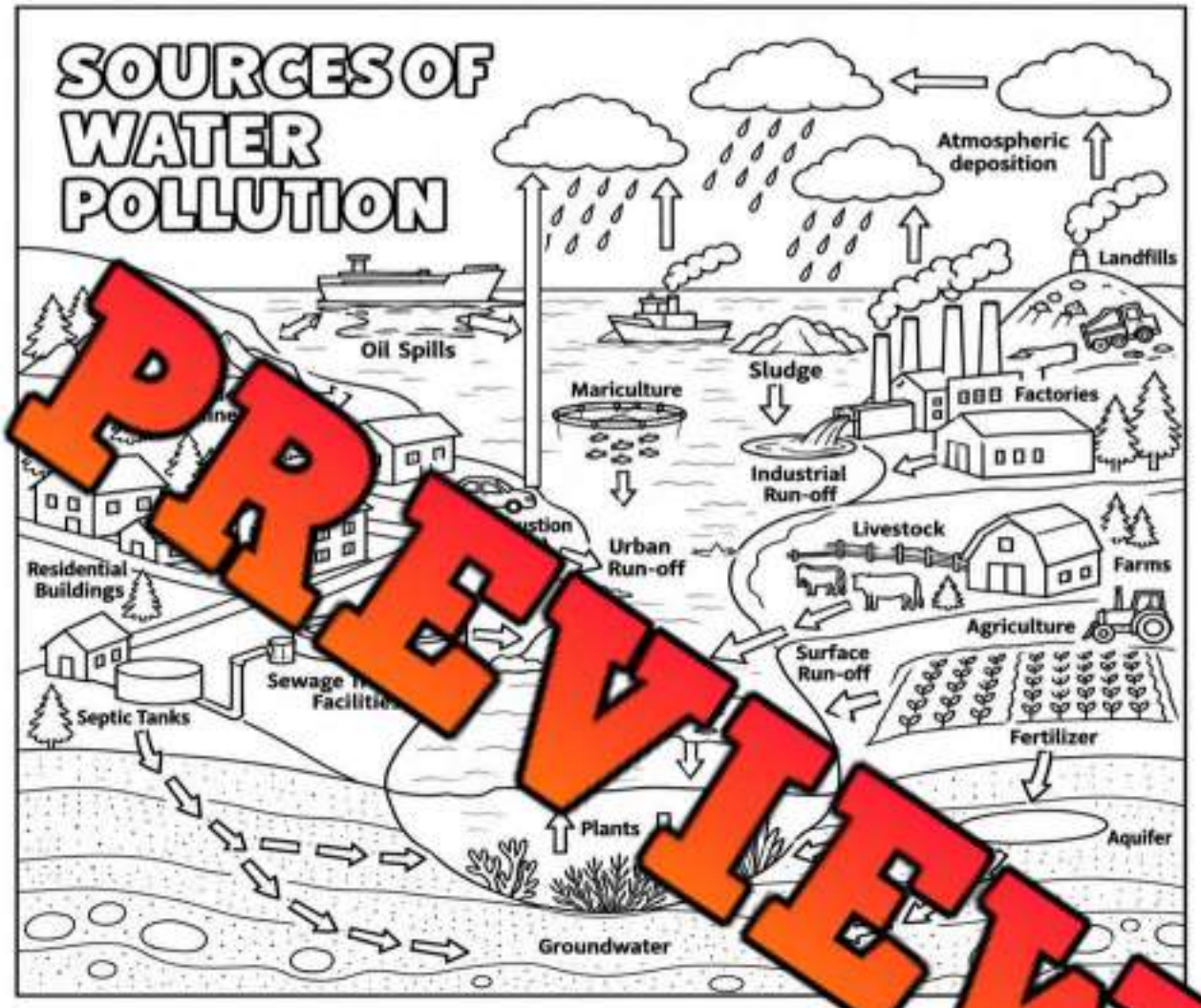
1) Prescription drugs like antibiotics enter our water and affect its quality.	True	False
2) Rural areas produce more water pollution.	True	False
3) Ash ponds are a result of burning coal for energy.	True	False
4) Agriculture is one of the biggest contributors to poorer water quality.	True	False
5) Many agricultural practices result in too many nitrates in our water.	True	False

© Super Simple Sheets

Name: _____ 79

Curriculum Connection
E1.1, E2.6

Human Activities Affecting Water Quality



PREVIEW

Analyze What human activities above do you see affecting

1)	
2)	
3)	
4)	
5)	
6)	

© Super Simple Sheets

Name: _____ 80

Curriculum Connection
E1.1, E2.6

Research – How Human Activities Affect Water Quality

How are human activities causing problems with each of the water quality indicators below.



Research Determine how humans affect the water quality indicators below.

1) What human activities cause changes in dissolved oxygen?

2) What human activities cause changes in water temperature?

3) What human activities cause more or less nutrients in our water?

PREVIEW

Curriculum Connection
E1.1, E2.6

4) What human activities cause bacteria to be added to water?

5) What human activities cause turbidity issues in water?

6) What human activities should we stop doing to keep our water q

PREVIEW

© Super Simple Sheets

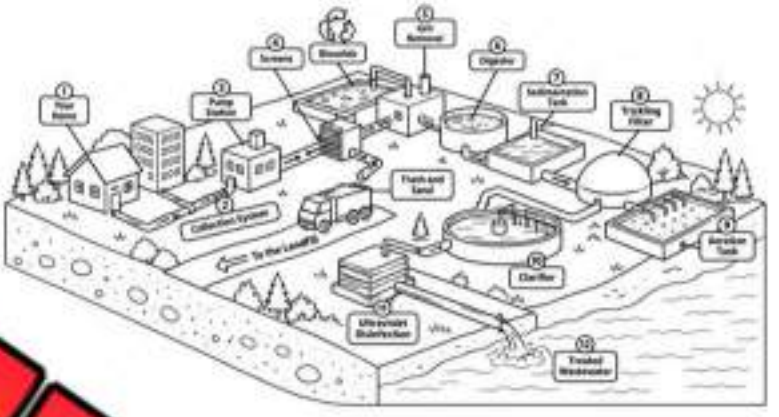
Name: _____ 86

Curriculum Connection
E1.3, E2.7

Primary and Secondary Water Treatment

What is the Difference Between Wastewater and Sewage?

Wastewater is any water that has been negatively affected in quality. Wastewater can come from human activities in their homes, or commercial buildings. It can also come from factories, where a higher percentage of chemicals are disposed of in the water. Wastewater could be created through agricultural practices, or it could be rainwater from gutters on a house.



Sewage is a type of wastewater that is pro[illegible] by people in a community [illegible] arried to a sewage treatmen[illegible] a sewer syste[illegible] types of sewag[illegible] water. **Blackwate[illegible]** is wa[illegible] ha[illegible] een used in toilets, **[illegible]ater** wastewater from [illegible]shwa[illegible] bathtubs, and washing [illegible] Blackwater needs more t[illegible] beco[illegible] **water**, which is clean, drinking water.

From Wastewater to Drinkable [illegible] – P[illegible]ndary Water Treatment

Below are the steps of a typical wastewa[illegible]ment

1) When water leaves our homes or s[illegible] it is ta[illegible] p[illegible]oing station close by
2) The wastewater is pumped to the main water t[illegible]ent p[illegible]
3) There is a screen that removes large materi[illegible]h as [illegible]tics
4) Grit and heavy inorganic solids are removed at t[illegible] treat[illegible]
5) The primary clarifiers allow any organic material to s[illegible] can [illegible]parated from the water. Grease is also removed during this step
6) The organic material and grease are pumped to a digester, which [illegible] further and become methane-rich gas. This gas can be used as a[illegible] to generate electricity
7) The water that moves on is called **effluent water**, which is water that flows out as treated wastewater. This water isn't ready to drink, but it is free of sediments and will look clean
8) The effluent water moves to an aeration tank, where any contaminants like phosphorus are removed
9) The water then goes to the secondary clarifier, where chemicals are added to removed more contaminates
10) The last step is the ultraviolet disinfection of the water. This step disinfects the water ensuring it is clean. The water is then usually released into a body of water
11) Another treatment plant will take the water from the body of water and treat it further to ensure its quality

PREVIEW

© Super Simple Sheets

Name: _____ 87

Curriculum Connection
E1.3, E2.7

Questions

Use information from the text to support your answer.

1) What is the difference between wastewater and sewage?

2) How is [illegible]er created? Give examples.

PREVIEW

Summarize

How is wastewate[illegible]om [illegible] so it becomes drinkable water?

True or False

Circle whether the statement is true or false.

1) Blackwater is water from the bathroom sink.	True	False
2) Water from toilets is treated and becomes whitewater we drink.	True	False
3) The disinfecting process uses ultraviolet technology.	True	False
4) A digester allows organic matter to break down to create methane gas.	True	False
5) Water from these treatment plants usually returns directly to our homes.	True	False

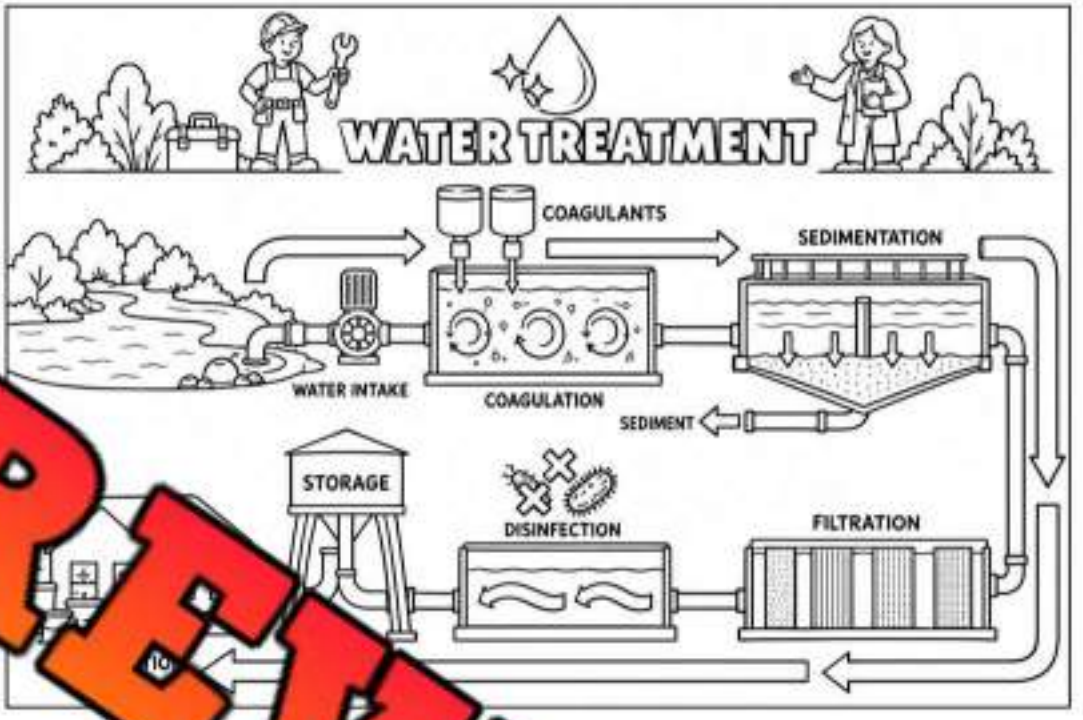
© Super Simple Sheets

Name: _____ 88

Curriculum Connection
E1.3, E2.7

Research – Tertiary Water Treatment

When treated water is returned to a body of water, it is then taken through another process of treatment before we drink it. Research [illegible] from the [illegible] to lea[illegible] about [illegible]rocess.



Research

Answer the questions below.

1) What does water intake in the diagra[illegible]to?

2) What is coagulation in water treatment?

3) What is sedimentation in water treatment

4) What is filtration in water treatment?

5) What is disinfection in water treatment?

PREVIEW

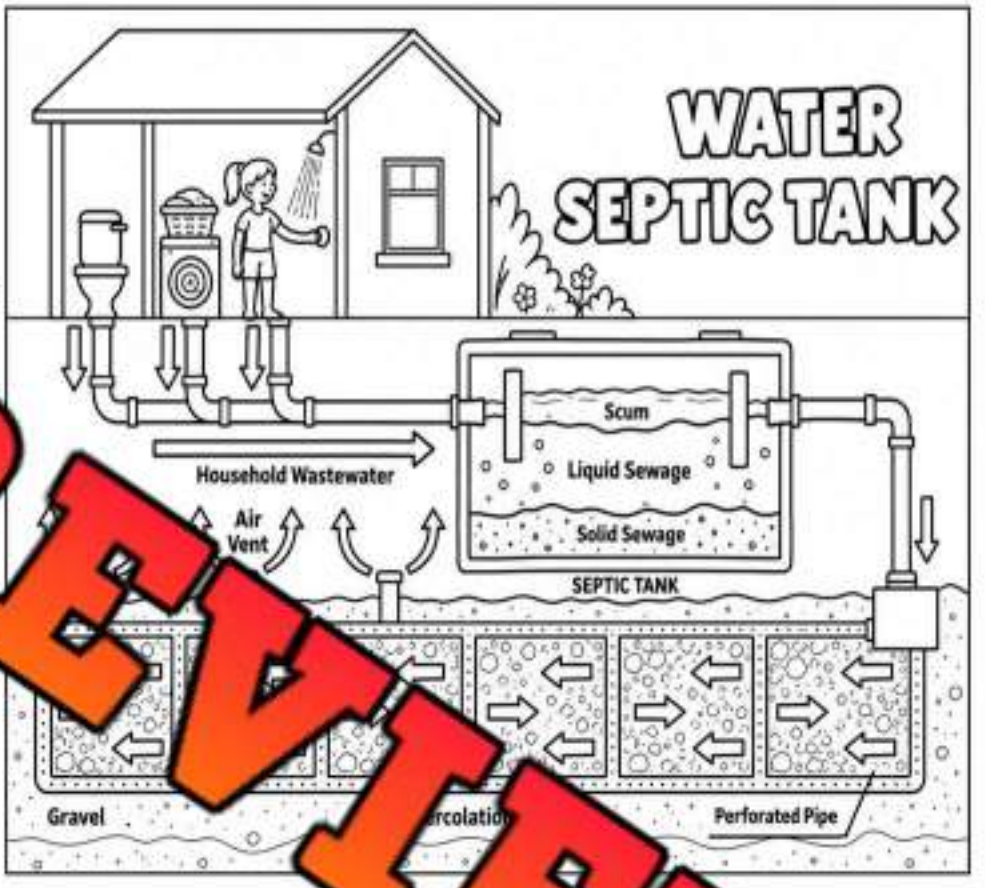
© Super Simple Sheets

Name: _____ 89

Curriculum Connection
E1.3, E2.7

Rural Wastewater Treatment – Septic Tanks

What is a Septic System?
A **septic system** is an underground wastewater treatment structure that is commonly used in rural areas that do not have sewer syst[illegible]. Below are the steps [illegible]ater takes before b[illegible]duced back [illegible]



PREVIEW

1) [illegible]ater is [illegible] a household [illegible] into a sep[illegible]
2) The watery wa[illegible] called effluent, filt[illegible] most of the tank
3) The scum floats to the top. It is composed of fats, like greases in oils that often come from our kitchen sink
4) The solid sewage comes from toilets. It sinks to t[illegible]
5) There is an outflow pipe that has a screen on it to blo[illegible]oli[illegible]g the septic tank
6) The effluent flows through the outflow pipe and into the draina[illegible]ea has perforated pipes, which are pipes with holes in them.
7) The water will drain through the holes in the pipes so that it is returned back to the environment. These pipes rest on a gravel bed, which further filters the water
8) The water will seep down into the groundwater and aquifers

Pros of a Septic Tank
- ✓ Most cost efficient – no monthly fees with a septic tank
- ✓ Durability – lasts a long time if properly maintained

Cons of a Septic Tank
- ✓ Requires pumping – every three to five years, the solid sewage needs to be pumped
- ✓ Backed up drains – the pipes in the septic tank can get clogged if toilets are misused
- ✓ Broken pipes – tree roots, digging, or earthquakes can break pipes underground

© Super Simple Sheets

Name: _____ 90

Curriculum Connection
E1.3, E2.7

Questions

Use information from the text to support your answer.

1) Where are septic tanks commonly used? Why is that the case?

2) How do [illegible]nks work?

PREVIEW

Pros/Cons

What are the [illegible] septic tank?

Pros	Cons

True or False

Circle whether the statement is true or false.

1) Most houses in big cities have a septic tank.	True	False
2) A cottage is more likely to have a septic tank.	True	False
3) Septic tanks take wastewater and release it back into the groundwater.	True	False
4) You could drink the water that comes out of a septic tank.	True	False
5) Scum floats, like oils and greases from our kitchen.	True	False

© Super Simple Sheets

Name: _____ 91

Curriculum Connection
E1.3, E2.7

Research – Local Water Treatment Plant

Not all rural areas have their own water treatment plants. Instead, many families use a septic tank to manage their wastewater.

In Ontario, there are 423 water treatment plants. If your community has only septic tanks, research a community close to you that has a water treatment plant. Learn more about the process of how wastewater is treated before it becomes drinkable water.

Research and answer the questions below.

1) Wh[illegible]ty [illegible]u choose? What is the name of the water treatment plant?

2) How many pe[illegible]s the w[illegible]tment plant service?

3) How many pumping statio[illegible]rt [illegible]reatment system?

4) Describe the process of how water is treated at [illegible] wate[illegible]ent plant.

PREVIEW

Curriculum Connection
E1.3, E2.7

Research | Answer the questions below.

5) How many people work for the city's water system? What are some of the jobs these people have?

6) What process of d[illegible]violet, chlorination, ozone, chloramines?

7) Which body of water is the treated w[illegible]

8) What other interesting facts did you learn ab[illegible]r ci[illegible]tment system?

PREVIEW

© Super Simple Sheets

Name: _____ 99

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

Experiment – Making A Water Filter

Research Question Can we filter dirty water and make it clean again using the materials below?

_____

_____

_____

Mat …will you need for the experiment?

- ❑ 2-litre pla… …ptie… …clean
- ❑ Dirty water (u… …coffe… …ld crunched up leaves, cooking oil, or tiny pieces of foam)
- ❑ Measuring cup
- ❑ Spoon
- ❑ Stopwatch or any clock with a seco… …d
- ❑ Filtering materials – use as many as you can fi… …tivat… …coal, gravel, sand (coarse and/or fine), cotton balls
- ❑ Coffee filter (old sock, napkin, paper tower will …or…

Procedure How will you complete the experiment…

1) Cut the top off the 2-litre bottle and flip it over to fit it back inside the cut part of the bottle
2) Place the coffee filter or paper towel into the bottom of the filter
3) Add all your materials as layers into your filter. Do this strategically in terms of size of materials.
4) Record the order of your materials on the back of this page. Draw a diagram of the filter
5) Stir the dirty water and measure a cup of it
6) Pour the dirty water into the filter. Time how long it takes for the water to pass through the filter
7) Carefully scoop out the filter materials. Make a note of which materials took what out of the water.



PREVIEW

© Super Simple Sheets

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

Observations

What did you notice as you completed the experiment?

1) Which materials did you use for the layers in your filter?

2) Draw a [illegible]m of the layers of your filter. Label each layer.

3) How long did it take for the water to [illegible]ough [illegible]er?

4) When you took the materials out, did you notice [illegible]t which parts of the dirty water?

5) Compare your observations with your classmates. Did you notice a relationship between the cleanliness of the water and the time it took for it to pass through the filter? If so, why would that be?

PREVIEW

© Super Simple Sheets

Name: _____ 106

Curriculum Connection
E1.2

How the Indigenous Use Water

Honouring Water – First Nations, Métis, and Inuit
Water is honoured by indigenous groups. Water is the most life sustaining gift on Mother Earth. It provides an interconnection between living things as all living things need water. Water flows between us, within us, and it replenishes us. Water is the blood of Mother Earth.

The Indigenous understand that water is the giver of all life. Without clean water, all life will perish. The Indigenous recognize the sacredness of water, so their lifestyles promote the protecting of water from pollution, drought, and waste.

Water Is
For many Indigenous groups, water is critical to all aspects of their lives. They fish in the waters and food for energy. They use rivers and lakes for transportation routes using c

The Inuit travel in the ice to travel along. They use sea to move about the sea ice is an extension of the land ice allowing them to travel from community to community. connects them with the ocean where they get the majority of their food.



Indigenous Sustainable Water Practices
Farming
The Indigenous farm using minimal water. They grow plants that can withstand periods of drought. They also do not farm in excess, as they plant enough to meet the needs of their community. The Indigenous also do not use fertilizers or pesticides that negatively affect the quality of their drinking water. Yet, the Indigenous are exposed to poor drinking water because of the farming practices other communities. Many Indigenous communities do not have the infrastructure setup to treat their water even though it is not their activities that are degrading the water in the first place.

Pollution
The Indigenous understand that pollution is not an option. Their spiritual connection to Mother Earth means that when the Earth is unhealthy, they feel unhealthy. This means the problems with water pollution other communities are having, are not being caused by the Indigenous.

Water is Sacred – Indigenous Day



Pollutants like the ones from factories in the form of ash pools are not being caused by the Indigenous. **First Nations Versus Fossil Fuels** is an organization of First Nation members that oppose the water and air polluting burning of fossil fuels.

PREVIEW

© Super Simple Sheets

Name: _____ 107

Curriculum Connection
E1.2

Question How do the Indigenous view the following differently than other communities.

Farming	
Pollution	

Questi ...in...ion from the text to support your answer.

1) How do the ...eopl... ...bout water? How do they use water?

2) Do the Indigenous people create poo... ...inking w... ...is p... ...drinking water affecting them? Is that fair? Explain.

PREVIEW

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

1) The Inuit use sea ice to travel from community to community.	True	False
2) The Indigenous feel that when the water is unhealthy, they are unhealthy too.	True	False
3) The lifestyle of Indigenous people creates a lot of pollution.	True	False
4) Development is more important to the Indigenous than the Environment.	True	False
5) To the Indigenous, water is the giver of life.	True	False

© Super Simple Sheets

Name: _____ 108

Curriculum Connection
E1.2

Research – Clean Drinking Water for Indigenous Communities

Everyone in Canada should have access to clean drinking water. The Canadian government is working with First Nations communities to achieve clean drinking water on reserves.

Research Learn more about the quality of drinking water on reserves.

1) What is a drinking water advisory?

2) How many First Nations communities had drinking water advisories?

3) How many First Nations communities do not have access to clean water?

4) Why is it unfair that these First Nation communities do not have access to clean water? Who is doing most of the polluting of their water?

PREVIEW

Curriculum Connection
E1.2

Research Answer the questions below.

5) Why do drinking water advisories in First Nation communities happen?

6) How was the Grassy Narr... Na... eschoseewagong Netum Anishinabek) affected by mercu... poiso... ...l the poisoning? Does the poisoning still affect the community? E...

PREVIEW

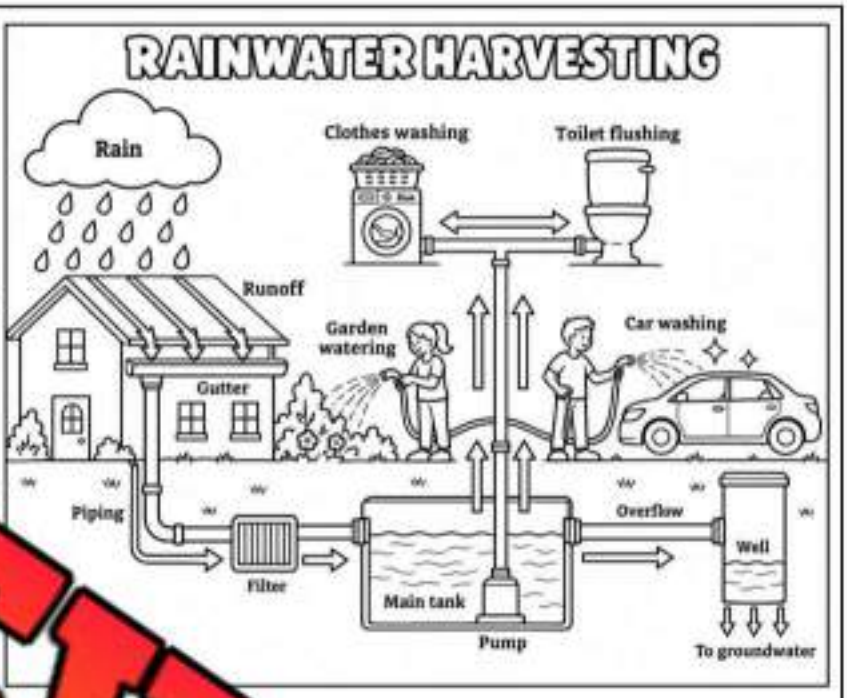
Name: _____ 110

Curriculum Connection
E1.3

New Technologies – Rainwater Harvesting

What is Rainwater Harvesting?

Rainwater harvesting is collecting rainwater run-off from a structure in order to store it for later use. We can harve[illegible]water by channelling the rainw[illegible] the roof of our hous[illegible] storage tank. Ra[illegible]ater h[illegible]n be as simple as coll[illegible] a ba[illegible] It can also be comp[illegible], wi[illegible] systems that harvest rain[illegible] larger tanks that supply an ent[illegible] use[illegible]



PREVIEW

Rainwater is safe to use for almo[illegible]eed. Y[illegible]wash your clothes and car, water your garden, and flush your toilet with untre[illegible]ainw[illegible]u may even be able to drink your rainwater, if you filter and treat the ra[illegible]r a[illegible]

Rainwater Harvesting Around the World

The idea of rainwater harvesting may seem foreign to you, bu[illegible]s be[illegible]d the world. In rural areas in countries like Brazil, China, New Zealan[illegible]ater is scarce. These places have began using rainwater harvesting to meet their[illegible] needs.

Even though Brazil has 18% of the world's total freshwater, only 28% of Brazil's cities have enough water. Drought is a big problem in Brazil's rural areas and when it does rain, it only does so intermittently.

In 2003, a program called "Programa Um Milhão de Cisternas" ("One Million Cisterns") was created to provide one million homes with rooftop rainwater harvesting systems. These systems collect and store rainwater until the dry season. All that is needed is a gutter, a pipe, and a 16,000L tank. To get water out of the tank, a manual pump can be used. Having these systems is providing millions of people water in Brazil.

© Super Simple Sheets

Name: _____ 111

Curriculum Connection
E1.3

Questions Use information from the text to support your answer.

1) What is rainwater harvesting? What can you do with rainwater?

2) How is rainwater harvesting helping rural areas in Brazil?

PREVIEW

Diagram Draw a diagram of how a rainwater harvesting system works.

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

1) Rainwater can be used to drink without treating or filtering it.	True	False
2) Rainwater harvesting is done by collecting water runoff from a roof.	True	False
3) Rainwater harvesting allows rural areas in some countries to get water.	True	False
4) All of Brazil has access to freshwater.	True	False
5) Rainwater is the same as ocean water.	True	False

© Super Simple Sheets

Name: _____ 115

Curriculum Connection
E1.3

Desalination Techniques

What is Desalination?

Desalination is the process by which saline water is converted into freshwater we can drink. With 97.5% of all surface water on the earth being salt water, it could become important to develop desalination methods to provide us with more freshwater. In the past, it has required too much energy to convert salt water into freshwater. The more energy-efficient method is treating the freshwater we already have.

How scientist know that our misusing of freshwater could lead to more and more com running out of freshwater. That is why energy-efficient methods of desalina tant. Today, only 1% of the freshwater we use comes from the desal



Process Desal

One of the mo ods desalination is ca illati

Distillation is when a elevates the temperature alt water so that it begins to eva The evaporated water condenses on cool surface creating water droplets. These droplets are freshwater as the salt and other minerals do not evaporate.

Solar distillation is when the sun is the primary heat source that causes the evaporation. In this process, water is pumped up from th thr filt and into a desalination tank. The filter ensures no large sedimen r pi tank. The evaporation inside the tank leads to freshwater condens through the out pipe. The salt and minerals return to the ocean throug e on the bottom.

PREVIEW

Advantages and Disadvantages of Solar Distillation

Advantages of Solar Distillation	Disadvantages of Solar Distillation
✓ Simple to design and build	✓ Rate of distillation is very slow (6 litres a day)
✓ Low installation cost	✓ Only works on sunny days
✓ Simple maintenance	✓ Will not provide enough water for a lot of people
✓ Can be used at the household level	✓ Can become corroded by the salt and minerals

© Super Simple Sheets

Name: _____ 116

Curriculum Connection
E1.3

Questions

Use information from the text to support your answer.

1) Why might improving desalination techniques be important?

2) What is a solar distillation system? What are their pros and cons?

PREVIEW

Diagram

Draw your diagram of a solar distillation system.

True or False

Circle whether the statement is true or false.

1) A solar distillation system turns saltwater into freshwater.	True	False
2) Most of the Earth's water is freshwater.	True	False
3) Desalination techniques could be useful in giving us more freshwater.	True	False
4) Desalinating is done a lot now and provides us with a lot of freshwater.	True	False
5) Desalination techniques use too much energy right now to be effective.	True	False

© Super Simple Sheets

Name: _____ 118

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

Desalinization Science Experiment

Research Question — What are we learning more about?

Desalinization is the removal of salt from water. Since freshwater (non-salt water) is scarce compared to the amount of saltwater available, using desalinization techniques could end water shortages.
Today, we will test one desalinization technique.

Material — What do we need?

- ✓ Large pot
- ✓ Salt
- ✓ Water
- ✓ Spoon
- ✓ Boil safe mug
- ✓ Tinfoil
- ✓ Ice
- ✓ Stovetop
- ✓ Plastic spoons to taste - optional





PREVIEW

Method — How do we complete the experiment?

1) Mix salt into a large pot of water. If you use warm water, it will dissolve the salt faster. You can let students taste the saltwater at this point.
2) Place a mug inside the pot. Be careful not to get any saltwater in the mug.
3) Cover the pot with tinfoil. Seal the edges but allow enough slack for the middle to dip slightly.
4) Put the ice cubes in the middle.
5) Put the pot on the stovetop and turn it on, bringing the water to a boil.
6) Let the saltwater simmer for about 10 minutes or until the ice cubes melt. Don't let it boil dry.
7) Turn off the heat and let the pot cool for 20 – 30 minutes. Once cool, carefully remove the tinfoil.
8) Have students taste the water in the mug using their spoon. You can also have them taste the water left in the pot.

© Super Simple Sheets

Name: _____ 119

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

Observations

What happened? How did each of the liquids taste?

Liquid	How Did It Taste? Describe the saltiness. Rate it from 0 – 10 (10 being most salty thing you've ever had)
Saltwater Mixture Before Boiling	
Water in	
Saltwater Left in the Pot	

PREVIEW

Results

Answer the q... bele...

1) What is desalinization? Why is it imp...

2) Why was the water in the mug freshwater? What happe... e s...

3) Why was the water left in the pot more salty than it was originally? Explain using the term concentration.

Name: _____ 120

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

STEM – Water Testing Technologies

Changing Technologies



For farmers, the most important thing is the quality of their soil and water. In the past, farmers had to send their soil and water samples to science laboratories to test the quality. The process was time-consuming and cost a lot of money.

Toda[illegible]rmers can use something called an AgroPad t[illegible]eir water and soil quality. To run the test, you [illegible]groPad (a card about the size of a bank card), and put a drop of water or soi[illegible]than 10 seconds, the card will change colours.

[illegible]you use[illegible]Pad app on your smartphone to scan the card. The app will then give[illegible]ou the[illegible]ne[illegible]d to understand the quality of your water and/or soil. The app will test t[illegible]e, m[illegible]um, aluminium, and nitrogen levels found in the soil and water. If farm[illegible]test [illegible]d water, they can add the nutrients it needs to be healthy. Healthy [illegible]an[illegible]er crops and more food for everyone!

The AgroPad is ma[illegible]. It is h[illegible]mily farms around the world. IBM understands that 80% of food[illegible]ide[illegible]n family farms. These family farms need to be supported by the fiel[illegible]sci[illegible]gy.

PREVIEW

Multiple Choice

Circle the correct answe[illegible]

1) The AgroPad is made by	I[illegible]	Microsoft
2) The AgroPad can test the quality of water and	[illegible]	[illegible]ir
3) You can find out if your water or soil has too much	[illegible]	[illegible]ium
4) You can add _____ if your soil is low in something	Wate[illegible]	Nutrients
5) Family farms grow what percentage of food worldwide?	50%	80%

Question

How is technology helping farmers around the world?

© Super Simple Sheets

Name: _____ 121

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

STEM – Water Testing Invention

Create your own invention that tests the quality of water and adds nutrients to make the water quality better. Use the legend below to know what to add.



Test Results	What to Add When High Levels	What to Add When Low Levels
Levels of pH	Sodium bisulfate	Sodium Bicarbonate
Levels [illegible]lorine	Hydrogen peroxide	Chlorine
Levels [illegible]um	Sodium	Magnesium
Lev[illegible]	Malic acid	Aluminum
Level[illegible] nitrog[illegible]	Chlorine	Nitrogen

PREVIEW

IF/THEN [illegible]de fo[illegible]tion.



If the pH is high and magn[illegible] low

THEN

If chlorine is high and nitrogen is low

THEN

If nitrogen is high and aluminum is low

THEN

If the levels of pH, magnesium and nitrogen are high

THEN

If the pH, nitrogen, magnesium, and aluminum are low

THEN

If the pH and chlorine are high, but the aluminum and magnesium are low

THEN

© Super Simple Sheets

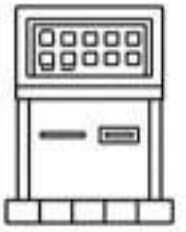
Name: _____ 122

Curriculum Connection
A1.1, A2.2, A3.1, A3.2, A3.3

STEM – Water Testing Invention

Draw your invention. Make sure the invention has:

- ✓ A place to put the water
- ✓ A screen to tell you the results
- ✓ A start button
- ✓ Any other buttons it will need to work



PREVIEW

Name: _____ 123

Curriculum Connection
A1.1, A2.1, A2.2, A3.1, A3.2, A3.3

Questions Answer the questions about your machine below.

1) How does your water testing machine work?

2) What [illegible] your machine have?

3) For at least 2 buttons, [illegible] that [illegible] machine what to do when the button is pressed. For example, if on b[illegible] pre[illegible] light.

4) How will your machine help people? Explain its impact on the world.

PREVIEW

© Super Simple Sheets

Name: _____ 124

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

STEM Math connection – answer the questions below.



1) How much does it cost for you to make your machine? Think of the parts you will need and estimate a price.

2) How ma[illegible]nits will you make at first?

3) How much [illegible] co[illegible]u in total?

4) How much will you sell one u[illegible]or?

5) How much net profit will you earn if you sell 1,000 [illegible]o[illegible] net pr[illegible]u'll find the gross and subtract the cost to build the 1,000 units.

6) If you want to make $1 million in net profits, how many units will you need to sell?

7) If you invent this with 2 other friends (3 total people), how many units will you need to sell to each earn $5 million in net profits?

PREVIEW

Name: _____ 125

Curriculum Connection
A1.1, A2.2, A3.1, A3.3

Writing Code – Ottawa's Water Service

Automation is so much more efficient than manually performing work. Furthermore, automation makes less mistakes, as there are no user-errors. That is why the City of Ottawa has hired you to automate their billing service.

They would like you to write a code that charges people based on how much water they use. Below is what they want to charge residents for how much water they use.



ier	Amount of Water	Cost
	Up to 6 cubic metres	$1.00/m^3
	to 25 cubic metres	$1.50/m^3
	cubic metres	$2.00/m^3
	re tha bic metres	$2.75/m^3



PREVIEW

Coding

Write code using statem t will send a bill to residents in Ottawa based on th r u

Name: _____ 126

Curriculum Connection
A2.1, A2.2

STEM Fill in the code below by calculating the cost of the water for the resident.

1) Fill in the blank below to determine how much the resident owes.

```
email = input ("please enter your email so we can send you your bill")
if resident uses [40 m³] of water
    then set [balance owed] to [          ]
    se[ ]alance owed] to [email]
```

2) De[ ]the[ ]ove works.

3) Fill in the blank below to determine how much t[ ]sider[ ]

```
email = input ("please enter your email so we ca[ ]d y[ ]
if resident uses [112 m³] of water
    then set [balance owed] to [          ]
    send [balance owed] to [email]
```

4) Fill in the blank below to determine how much the resident owes.

```
email = input ("please enter your email so we can send you your bill")
if resident uses [351 m³] of water
    then set [balance owed] to [          ]
    send [balance owed] to [email]
```

PREVIEW

© Super Simple Sheets

Name: _____ 127

Activities – Water Quality



Word Search

Find the words from the word bank.

Water	Quality	Temperature	Turbidity	Nitrates
Bacteria	Treatment	Septic	Sewer	Service
Desalina	Wastewater	Fertilizer	Methane	Conservation

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

PREVIEW



Word Scramble

Unscramble the words from the word bank.

ENATTTMER		NOIADSLINATE	
UTYITRBDI		ATRWE	
ATNMEEH		STRNTAIE	
LYTAUIQ		ECSPTI	
ICRAAETB		EERTUAPEMTR	

© Super Simple Sheets

Name: _____ Date: _____

Unit Test – Water Systems

Multiple Choice /10

1) An ice sheet is the _____ type of glacier. a) Largest b) Smallest c) Tallest d) Shortest	2) Which type of ice floats in the ocean? a) Ice cap b) Ice Shelf c) Ice Sheet d) Iceberg
3) What is the term for water seeping into the ground a) Evaporation b) Condensation c) Infiltration d) Deposition	4) What is the term for a stream or river that flows into a larger river? a) Confluence b) Tributary c) Spring d) Estuary
5) A man-made lake is called a a) Drainage Divide b) Basin c) Watershed d) Reservoir	6) Which type of well provides the safest a) Dug well b) Drilled well c) Artesian well d) None of the above
7) Which aquifer is surrounded by rock and clay with no exposure to the ground level? a) Unconfined aquifer b) Reservoir aquifer c) Ground aquifer d) Confined aquifer	8) When an area is affected due to being on a coast or a) Microclimate b) Tropical climate c) Macroclimate d) Climate Zones
9) Which type of tropical storm hits North America? a) Cyclones b) Hurricanes c) Typhoons d) None of the above	10) Which term explains how cloudy water is? a) pH level b) Bacteria c) Turbidity d) Dissolved Oxygen

PREVIEW

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

Term	Definition (what does it mean)
Glacier	
Watershed	
Freshw	
Aquifer	

PREVIEW

Short Answer Questions (2 ch)

1) What are the three states of w r on How is the water moved around the Earth?

2) Where does rainwater that lands on your roof end up? Explain its

3) What is a microclimate? How does living on the coast sometimes cause a microclimate?

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

1) How do human activities cause changes in our freshwater? How is the freshwater treated so that it can be reused?

2) Explain why we should conserve o usa w can we do this? What changes can we make in our homes chools m scientific discoveries could provide us with more freshwater?

PREVIEW