WISE Activity Booklets

A STEM activity booklet for fun on-the-go learning!
Made by WISE Kid-Netic Energy

DIY Activities
Puzzles
Challenges
... and more!

Grade 7
AUGUST 2020

Interactions within the ecosystems - Forces and structures - Particle theory of matter - Earth's crust

University of Manitoba

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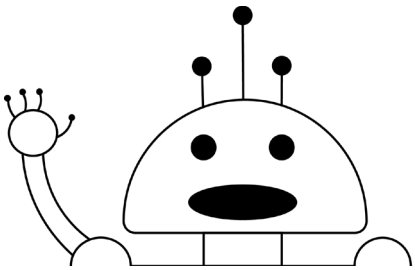


Hello there!

WISE Kid-Netic Energy is a not for profit STEM (Science, Technology, Engineering, and Math) outreach organization at the University of Manitoba. Our organization offers science and engineering workshops, clubs, camps and events to youth from Kindergarten to Grade 12 throughout the province of Manitoba. We reach on average 25 000 to 50 000 youth depending on funding levels. Our approach is simple – present STEM in messy, memorable and engaging ways so Manitoba youth feel motivated to learn more and more. We reach all Manitoba youth, and we particularly target underrepresented youth like girls, indigenous youth and youth facing socio-economic challenges.

All of us at WISE Kid-Netic Energy have been working hard to create these booklets to continue to bring our fun and educational STEM activities to Manitoba youth during these unprecedented times. We are disappointed that we cannot see you in person, and hope that these monthly booklets bring some STEM excitement to your life.

These booklets have been created by our student instructors who are all studying engineering, science, or in another STEM-related field at university. Peek the next page of this booklet to see who created the activities, experiments and recipes within.

All the activities in this booklet are based on the Manitoba Science curriculum. For any teachers viewing this booklet, all the SLO codes are listed at the bottom of each page.

We hope that you enjoy doing the experiments and activities as much as we loved creating them for you.

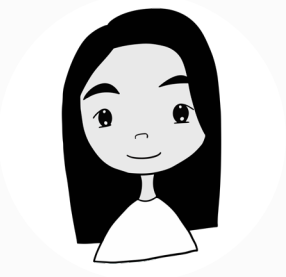
In this Grade _ booklet, the science topics you will be exploring are: interactions within the ecosystems, forces and structures, particle theory of matter, Earth's crust and more!

Best of luck, and until we see you again,

the WISE Kid-Netic Energy Crew

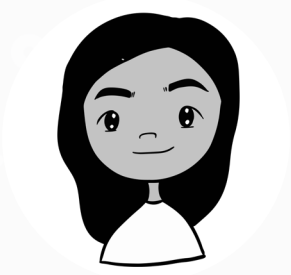
P.S. If you have any suggestions for activities or experiments you would like us to try, contact us through our website, or social media accounts that are listed on the last page of this booklet.

Meet our Amazing Authors!



Amaris

Amaris just finished her first year in sciences at the University of Winnipeg and plans on majoring in biology. In her free time, Amaris likes reading, playing piano and baking.

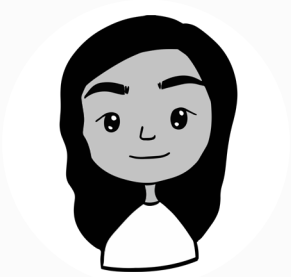


Gagan

Gagan is a fourth-year BSc Honours Student in the Department of Psychology. She enjoys being creative and loves to learn! In her free time, she likes to try new things, read, and grow plants.

Huda

Huda is in her first year taking general science courses and she's trying to decide between a degree in Microbiology or Genetics. She enjoys baking and cooking and her favorite activity is watching videos on YouTube!



Kajal

Kajal just finished her first year of Computer Science and is pursuing a Bachelors of Computer Science. She loves to read, sketch, and make things. She is excited to visit new places across Manitoba and work with kids!

Sophia

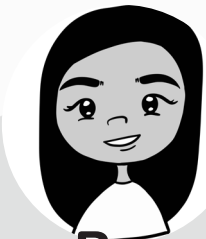
Sophia is in her second year of science and is planning on going into optometry in the future. She loves math and biology, and in her free time loves swimming, reading and trying new foods!

Esiw the Robot

Esiw is a friendly robot that loves to help kids learn about computers & coding! Esiw loves to do math, solve problems and make people laugh!

... and our Incredible Editors!

Alex



Bea

Mahalia

Michelle

Program the Organism

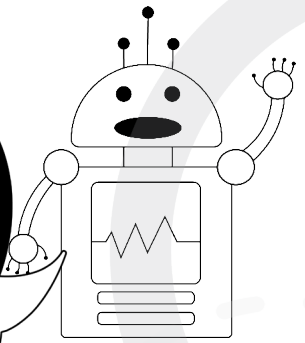
Photosynthesis is how plants make their own food, and cellular respiration is the way that animals and humans gain energy from molecules!

Below is a set of “code” in boxes that you must write in the correct order. The plant code and animal code are both mixed up, so make sure you sort them into the correct category.

Chlorophyll is a pigment present in the leaves of plants that allows carbon dioxide to be converted into oxygen.

Matter is recycled between ecosystems. Plants produce something that animals need, and animals produce something that plants need.

This is similar to a coding method done on a device called drag and drop programming, where someone selects text and moves it to a different area.



Control	Events	Motion
Repeat forever. Repeat forever. If chlorophyll is present, convert carbon dioxide into oxygen. If there is sugar present, then break it down into water and carbon dioxide. Else, eat food. If I receive sunlight for energy, then convert carbon dioxide into glucose.	When I feel there is carbon dioxide in the air. When I receive oxygen. When I feel there is water in the soil.	Breathe in. Open leaf pores. Absorb water with roots. Release oxygen. Breathe in. Use the energy. Breathe out to release carbon dioxide.

This activity continues on the next page!

Using the Control, Events and Motion from the previous page, write the code for the plant and animal boxes below. Start with the control. You can shorten the words in the code if you need to!

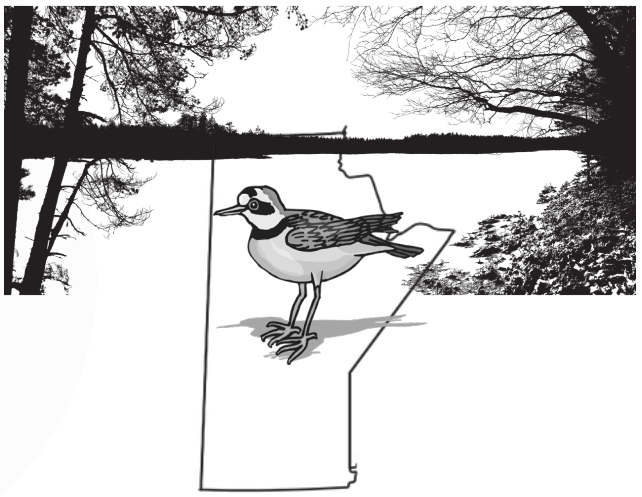
Plant code:

Animal code:

Factors of an Ecosystem

An **Ecosystem** is a geographic area made up of abiotic and biotic factors that interact with each other. It consists of animals, plants, organisms, rocks, temperature, humidity, etc. All of these factors work together to form an ecosystem. This is a delicate balance so if something goes wrong, everything in the ecosystem is affected. This is why we must preserve our ecosystems.

A larger problem can be broken down into smaller problems. Let's look at these smaller solutions as functions. In programming, a **FUNCTION** is a part of the program that accomplishes a goal and can be called over and over again. Some functions for the managment and preservation of an ecosystem and species are: environmental, economic and social.



ENDANGERED

Species: Piper Plover.

Habitat: Lakeshores and saline wetlands of southern Manitoba.

Location: In Manitoba, Piper Plovers are most consistently found nesting on broad beaches along Lake Winnipeg, Lake Manitoba, West Shoal Lake, and occasionally Oak Lake and Whitewater Lake.

Fill out the missing sections of the functions below with ideas of how we can help preserve the Piper Plover.

Function name: environmental
Goal: environmental ways to help preserve Piper Plovers.

Ways this can be done: protect their nests (maybe fence them off?)

Function name: economic
Goal: economic ways to help preserve Piper Plovers.

Ways this can be done:

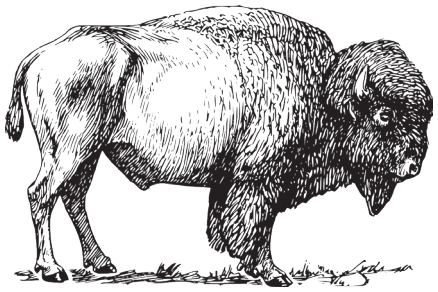
Function name: social
Goal: social ways to help preserve Piper Plovers.

Ways this can be done:

Each species listed below is or was native to Manitoba. List some environmental, economic and social factors that contribute to the situation of the species.

There are 4 types of species:

1. Extirpated species: have disappeared across Manitoba.
2. Endangered species: vulnerable to disappear across Manitoba.
3. Threatened species: native species that may become endangered due to declining numbers in Canada.
4. Special concern species: species that would become threatened or endangered if factors do not improve.



EXTIRPATED

Species: Plains Bison

Habitat: The Canadian range of plains bison once extended over the prairies, including grasslands, shrub-lands and some woodland areas. However, plains bison currently exist in regions containing suitable grasslands and meadows.

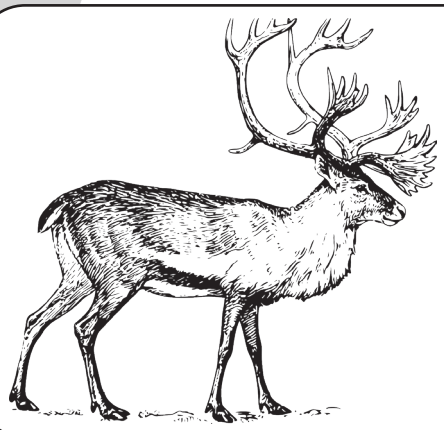
Potential causes:

ENDANGERED

Species: Peregrine Falcon

Habitat: Prefer open habitats such as tundra, grassland, sea coasts and marshes, but will also hunt in open forests. Their nests are built on ledges of steep cliffs. In areas where humans live, peregrines often nest on tall buildings with ledges. Pairs maintain a nesting territory of at least one kilometer radius.

Potential causes:



THREATENED

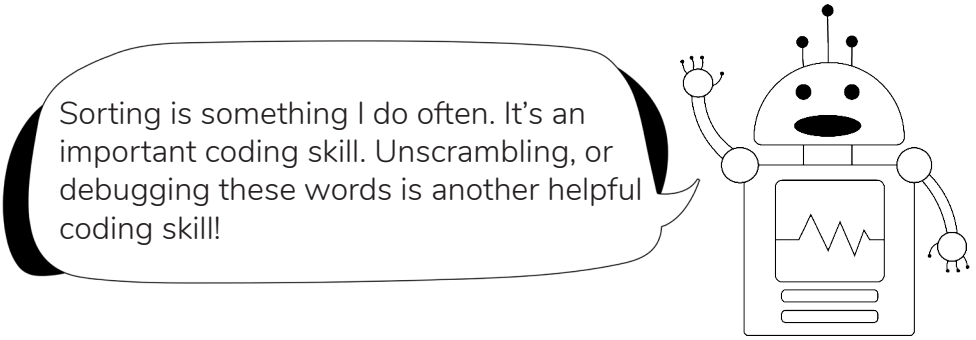
Species: Boreal Woodland Caribou

Habitat: Inhabit lichen-rich areas of the boreal forest, preferring mature pine, black spruce and tamarack forests, intermixed with peatland complexes. Large tracks of undisturbed habitat are required.

Potential causes:

Thermal Conductors and Insulators

Unscramble the words below and then identify if they are conductors or insulators. Draw a square around the conductors and a circle around the insulators.



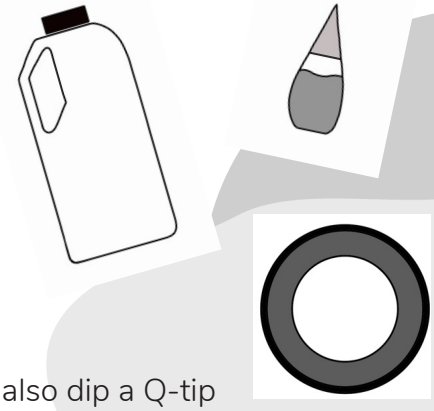
1. atewr _____
2. stalcip _____
3. veon timt _____
4. ucepasna _____
5. perocp erwi _____
6. mluinamy liof _____
7. odow _____
8. mheotsr _____
9. ria _____
10. elest anli _____
11. rokc odrab _____
12. ssrba yke _____
13. sgals _____
14. lowo _____
15. mafo _____
16. ehatesfsr _____
17. urf _____
18. lrectialce atpe _____

Particle Theory Reaction in Action

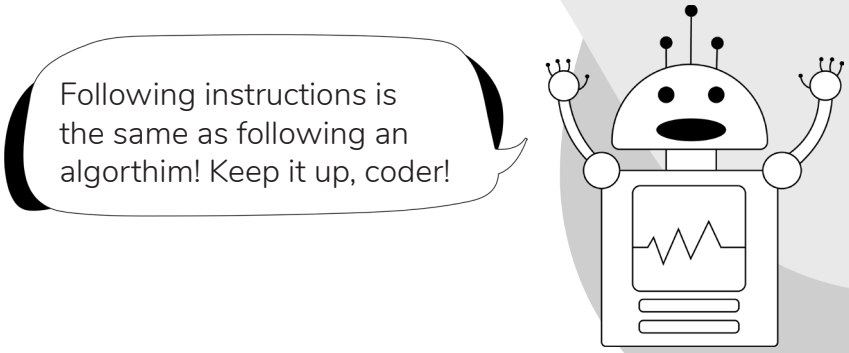
Materials

- Dish soap
- Milk (2% or higher)
- Food colouring
- Plate

Directions



1. Pour milk onto your plate until it covers the bottom of the plate.
2. Add food colouring to the milk near the centre of the plate, use as many colours you'd like! Make sure you can still see the milk.
3. Add a drop of dish soap to the middle of the plate (you can also dip a Q-tip into some dish soap and place that into the milk. Place it in different spots and see what happens!



What happened?

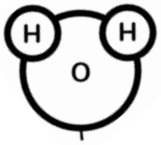
The super special ingredient for this experiment is soap! Soap molecules have two ends on them. One is **hydrophillic**, which means it's attracted to water, and one end is **hydrophobic**, which means it does not like water. Milk is a mixture of fat, water and a few other things. When you add soap to the milk it helps to separate the water and the milk. The **hydrophobic** end breaks up the fat molecules, and the **hydrophillic** end bonds with the water molecules. As all this movement happens, the food colouring gets pushed around and creates the designs you see on your plate! Try adding more soap, if there are fat molecules that haven't been bonded, the colours will continue to move!

Exploring further:

If you can, try using different types of milk or dairy products, like skim, 1%, 2%, half and half, or heavy cream. What do you notice between a liquid with a higher fat content or lower fat content? Which one works better for the experiment?

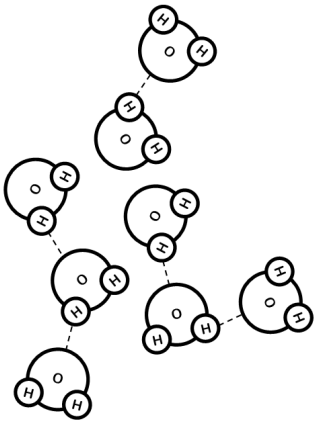
Heating Curve Experiment

You've probably heard that water's chemical formula is H_2O, which means that there are two hydrogen molecules bonded to one oxygen molecule, like this:

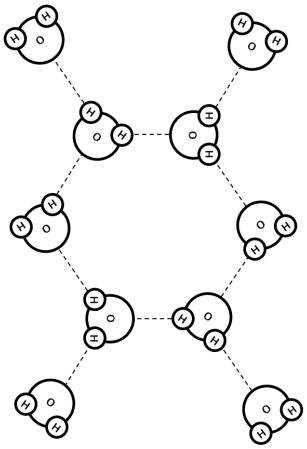


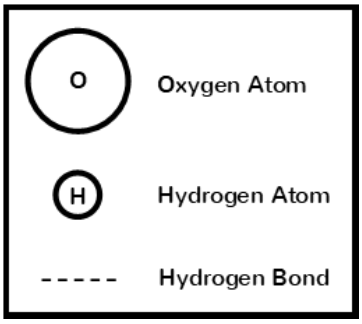
When water freezes, the hydrogens of the molecule bond to the oxygens of another molecule creating a solid. When bonded together, each molecule is further apart than in a liquid making ice less dense then water. When the ice is heated up, the heat breaks these hydrogen bonds forming liquid water.

Molecular Structure of Water

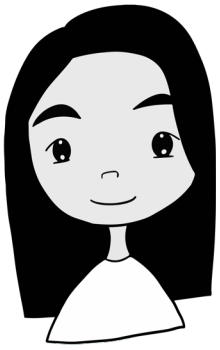


Molecular Structure of Ice





Did you know that water is the only substance whose solid floats? When any other substances, such as mercury or bromine, is in its solid state, it's more dense than its liquid, which makes it sink. It's really important that ice floats because in the winter when lakes and rivers freeze, the ice forms at the top of the water. This allows fish and other aquatic animals to live and survive in the water beneath the ice.



This activity continues on the next page!

SLO : 7-2-01, 7-2-05, 7-2-07

A heating curve is a graph that represents a substance's phase change as heat is applied to it over time. The plateau (where the graph looks horizontally flat) marks where a substance changes phase.

Create your own heating curve by observing the phase change of ice to water.

Materials

- Crushed ice*
- Container
- Thermometer

*If you don't have crushed ice, put some ice cubes in a tightly sealed bag and drop it on the ground a few times until the ice gets crushed. The larger the ice, the longer it takes to melt.

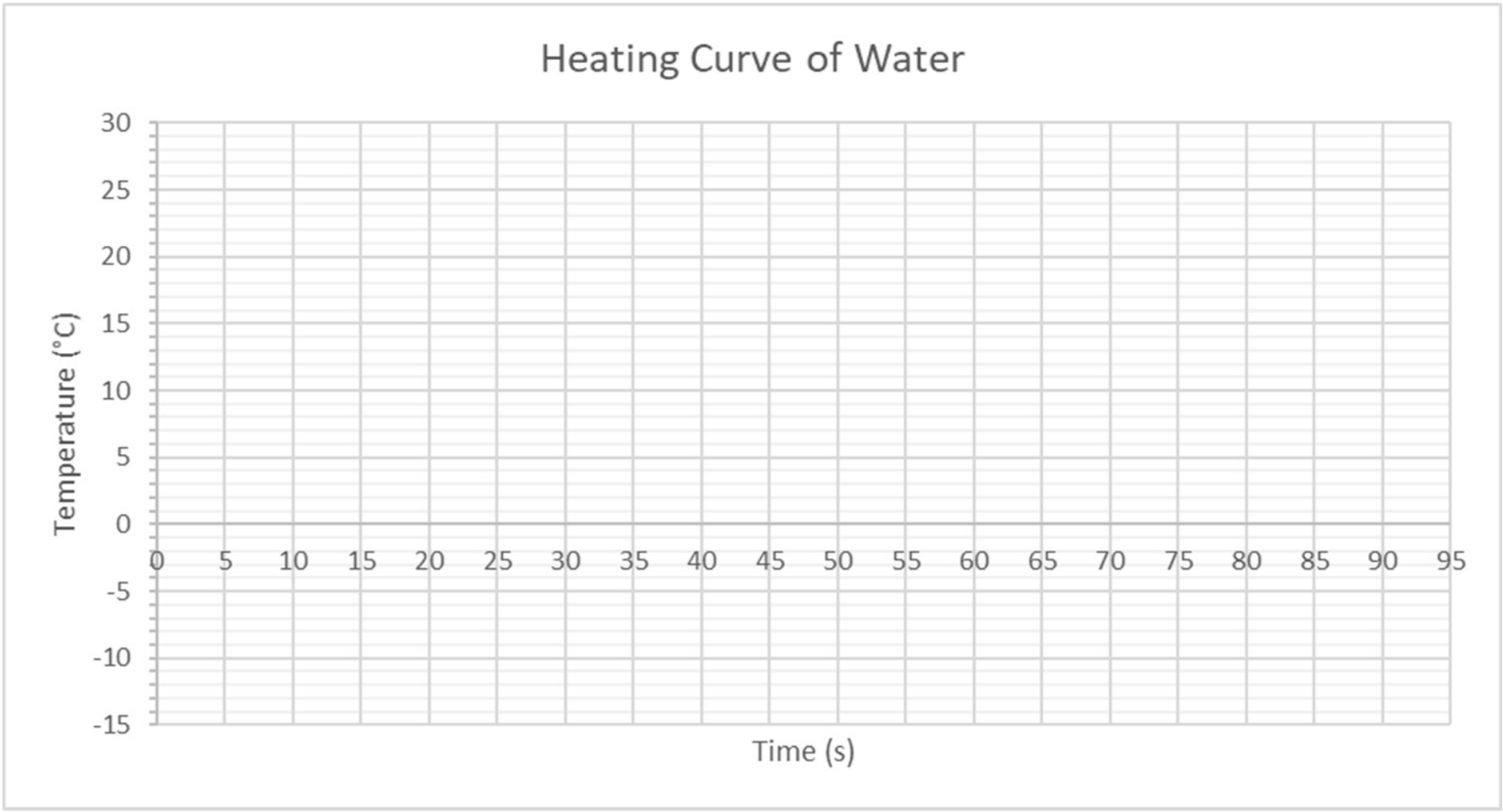
Directions

1. Put the crushed ice and thermometer in a container.
2. Stir the ice frequently and record the temperature every 5 minutes on the table below (you may not use all the spaces).
3. Stop recoding the temperature once the readings plateau around room temperature (around 22-24°C). Plot the data on the graph on the next page and label the type of phase change (solid to liquid, liquid to gas, etc.) at the plateau.

Time (m)	Temperature (°C)	Time (m)	Temperature (°C)
0		50	
5		55	
10		60	
15		65	
20		70	
25		75	
30		80	
35		85	
40		90	
45		95	

This activity continues on the next page!

Fill in the graph below with the data collected on the previous page.



Types of Structures

The three basic types of structures are **frame**, **shell** and **solid**.

1. **Frame**: This type of structure has a skeleton that provides structural support and resists forces that are applied to it. These types of structures are strong without using a lot of material. An example of this is your house.
2. **Shell**: This type of structure are hollow and usually curved, like an egg shell. Shell structures are light and strong.
3. **Solid**: A solid structure are made up by piling up material and giving it shape. These structures are strong but require a lot of material. An example of this is a sandcastle.

The types of structures can be considered as types of variables. For this activity, label the type of structure (variable) that the structure is made of. We also need to assign each instance of the variable a name. In this case, the name of the variable will be the name of the structure.

Variable Name:
Variable Type:

Variable Name:
Variable Type:

Variable Name:
Variable Type:

Variable Name:
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Variable Name:
Variable Type:

Building on Land

Earth has a limited amount of land that can be used and it is split up mostly between living and farming.

You, Esiw and 30 others from diverse backgrounds are on the committee of urban and land use planning. You must solve some issues that the residents have with creating a better living and working environment, along with creating more spaces for people who are moving into the city. The committee acknowledges that the city is located on Indigenous land. You meet with the committee to discuss the plan on land use.

During the meeting, one member suggests that the whole city be revamped. They suggest new housing developments, new shopping centres, and new parks. They explain that this would mean buying properties and evicting residents from their homes so that they can rebuild better, more modern and more expensive homes. Many members disagree with this idea. Why?

You stand up and speak against this idea. What do you suggest could be done to revamp the city instead?

Esiw explains that the city is located on the border of tectonic plates, which can cause earthquakes. It is important for the city to have an emergency budget for natural disasters like this that can happen unexpectedly. The city however is over budget because they're planning to add more schools, hospitals, and parks. What should they do?

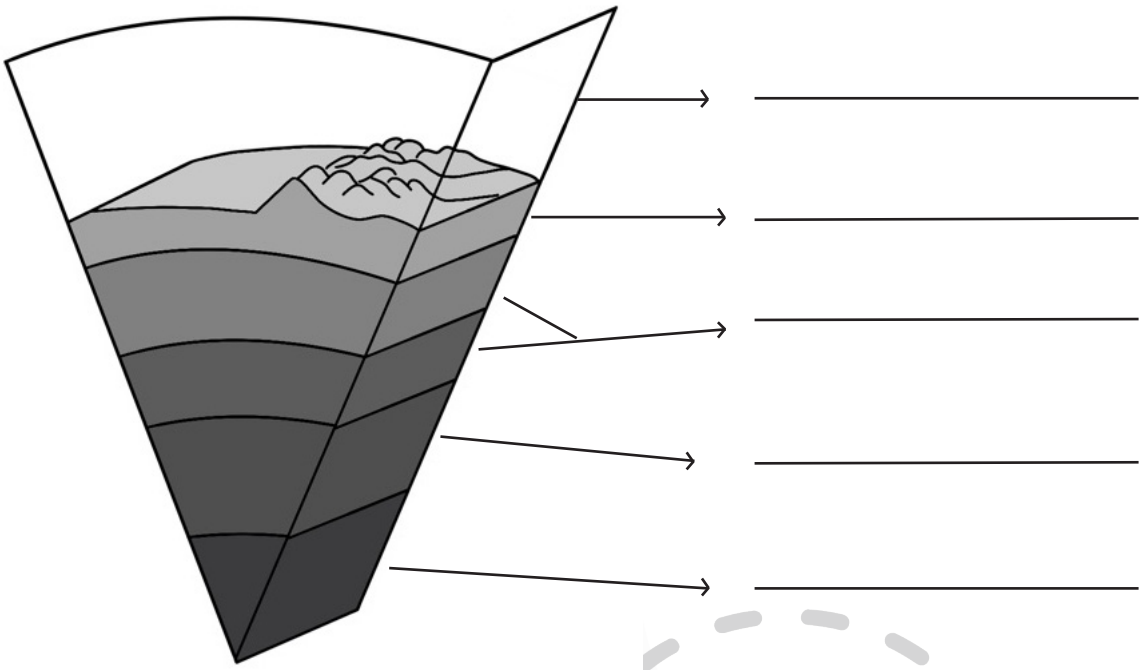
The planning committee is responsible for agriculture. The current farming system they are using provides habitat for many species of wildlife. However, it is very inefficient, and the committee agrees there will not be enough food for everyone. They can change the farming method, but it will cause huge water pollution. What should they do and why?

Layers of the Earth

Match the layer on the left side to its definition on the right side.

1	Atmosphere	●	A	Low viscosity fluid and suffers violent convection currents.
2	Crust	●	B	The thickest layer of Earth, made up of viscous rock and in a constant state of motion.
3	Outer Core	●	C	Solid and slowly growing. Affects the Earth's magnetic field.
4	Mantle	●	D	The thinnest layer of the Earth, and everything we can see.
5	Inner Core	●	E	The layer of gases surrounding the Earth.

Label the layers below!



Choose Your Own Adventure - Rock Formation

Find out what rock formation most resembles you! Using Boolean Algebra ~1~ is True or Yes, and ~0~ is False or No. Follow the prompt below to try and determine which rock formation best suits you.

Would you characterize yourself as energetic, like a volcanic eruption spewing out hot liquid called **Magma**?

0 → Would you describe yourself as **chill or cool**?

1 → When angry, are you able to **cool down easy**?

Would you describe yourself as **chill or cool**? — 1 → **Igneous**, forms from cooled magma that eventually solidifies.

When angry, are you able to **cool down easy**? — 1 → **Igneous**, forms from cooled magma that eventually solidifies.

Igneous, forms from cooled magma that eventually solidifies. → Can you withstand extremely **hot temperatures** or outside **pressure**?

Would you describe yourself as **chill or cool**? — 0 → Can you withstand extremely **hot temperatures** or outside **pressure**?

When angry, are you able to **cool down easy**? — 0 → Can you withstand extremely **hot temperatures** or outside **pressure**?

Can you withstand extremely **hot temperatures** or outside **pressure**? — 1 → **Metamorphic**, any rock form that has been under extreme heat/ pressure.

Can you withstand extremely **hot temperatures** or outside **pressure**? — 0 → Do you like to look at the different **parts or pieces** of a problem?

Do you like to look at the different **parts or pieces** of a problem? — 1 → **Sediments**, breaking of rock via water & wind, also known as weathering & erosion.

Do you like to look at the different **parts or pieces** of a problem? — 0 → Do you describe yourself as **"compact"** or put together?

Do you describe yourself as **"compact"** or put together? — 1 → **Sedimentary**, fragmented rock, with a tightly packed layer at the bottom, forming a rock.

Do you describe yourself as **"compact"** or put together? — 0 → **Lava**, when magma is on the Earth's surface.

Sediments, breaking of rock via water & wind, also known as weathering & erosion. → Igneous, Metamorphic, and Sedimentary rock can be broken into sediments.

Sedimentary, fragmented rock, with a tightly packed layer at the bottom, forming a rock. → Via heat and pressure sedimentary rock can become metamorphic.

Make Your Own Salt Crystal

Materials

- 1/2 cup of water
- 1/2 cup of salt
- Small pot
- Cloth string (anything but fishing wire)
- Pencil
- Food colouring (optional)
- Clear heat-proof container

Directions

1. Heat the water on the stove over medium heat until it just begins to boil.
2. Add salt to the pot and stir frequently.
3. Keep adding salt until it doesn't dissolve anymore. You should see some grains of salt on the bottom of the pot.
4. Pour the solution into a clear container. Make sure none of the grains of salt enter the container.
5. Add some food colouring if you want a coloured crystal.
6. Tie the string to the pencil and lay the pencil across the top of the container. If the pencil keeps rolling, use some tape to secure it.
7. The string should be hanging in the middle of the container and shouldn't touch the bottom or sides.
8. Place the container where it won't be disturbed. After 2-7 days, a crystal should form on the string!

How it works:

The hot water is capable of dissolving more salt than water at room temperature, allowing the solution to become supersaturated. When the water cools in the container, the salt begins to precipitate, meaning that it forms back into a solid. The salt collects on the string because its rough surface provides a good place for the salt to stick to.

There are many salt deposits that can be found around the world and even some in the western and southern parts of Canada. These natural deposits usually form around seas or salty bodies of water. The salt forms from the evaporation of the salt water and the eventual cooling of the salt back on land. Many of these salt deposits are continuously forming as the cycle of evaporation repeats.

Answer Key

Page 5:

Plant code:
1. Repeat forever
2. When I feel there is carbon dioxide in the air
3. Open leaf pores
4. When I feel there is water in the soil
5. Absorb water with roots
6. If I receive sunlight for energy, then convert carbon dioxide into glucose
7. If chlorophyll is present, convert carbon dioxide into oxygen
8. Release oxygen

Animal and human code:
1. Repeat forever
2. When I receive oxygen
3. Breathe in
4. If there is sugar present in my body, then break it down into water and carbon dioxide. Else, eat food.
5. Use the energy
6. Breathe out to release carbon dioxide.

Page 8:

1. Water [conductor]
2. Plastic (insulator)
3. Oven mitt (insulator)
4. Saucepan [conductor]
5. Copper wire [conductor]
6. Aluminum foil [conductor]
7. Wood (insulator)
8. Thermos (insulator)
9. Air (insulator)
10. Steel nail [conductor]
11. Cork board (insulator)
12. Brass key [conductor]
13. Glass (insulator)
14. Wool (insulator)
15. Foam (insulator)
16. Feathers (insulator)
17. Fur (insulator)
18. Electrical tape (insulator)

Page 13:

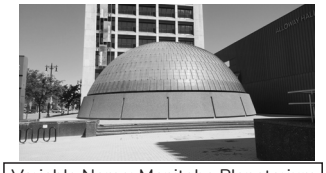
Variable Name: Pyramids
Variable Type: Solid

Variable Name: Louis Riel Statue
Variable Type: Solid

Variable Name: St Boniface Cathedral
Variable Type: Frame

Variable Name: Taj Majal
Variable Type: Shell

Variable Name: Eiffel Tower
Variable Type: Frame



Variable Name: Manitoba Planetarium
Variable Type: Shell

Page 16:

Matching:

1-E, 2-D, 3-A, 4-B, 5-C

In order:
Atmosphere
Crust
Mantle
Outer Core
Inner Core

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