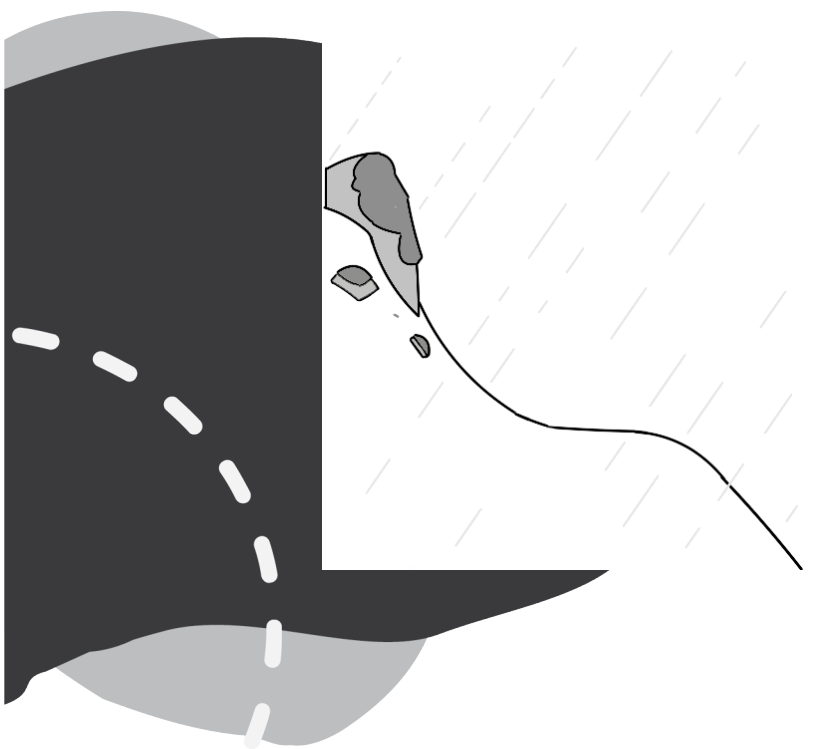
# WISE Activity Booklets

A STEM activity booklet for fun on-the-go learning!

**Made by WISE Kid-Netic Energy**

**DIY Activities**
**Puzzles**
**Challenges**
**... and more!**



## Grade 4
## VOLUME 6

Habitats & Communities - Light - Sound - Rocks, Minerals & Erosion

University of Manitoba

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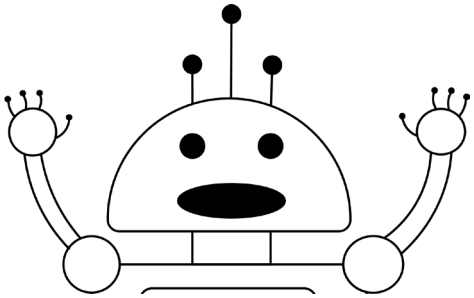


# Hello there!

**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.

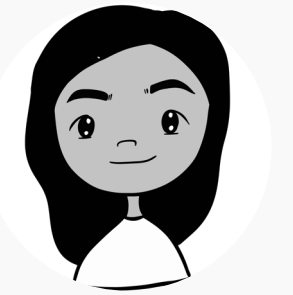
In this Grade 4 booklet, the science topics you will be exploring are: habitats and communities, light, sound, rocks, minerals and erosion, and more!

**Best of luck, and until we see you again,**

## the WISE Kid-Netic Energy Crew

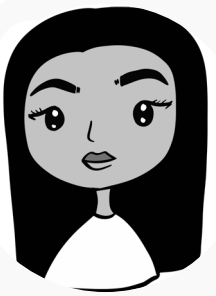
*P.S. If you have any suggestions for activities or experiments you would like us to try, contact us through our website, or social media accounts that are listed on the last page of this booklet.*

# Meet our Amazing Authors!



## 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.

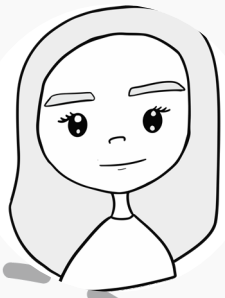


## Habiba

**Habiba** is a second year computer engineering student. In her free time, Habiba loves to learn about everything computer and internet related, but in her free time she likes to draw, go outside as well as cook.

## Katy

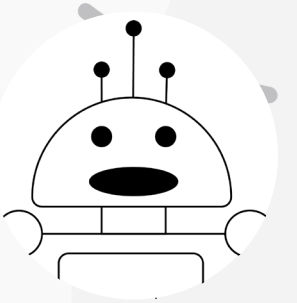
**Katy** has completed her second year of Biosystems Engineering at the University of Manitoba and is passionate about environmental sustainability and working with kids. In her spare time she enjoys running, painting, and spending time outside.



## Zoë

**Zoë** just finished her first year of Engineering, and is entering the department of Civil Engineering in the fall. She loves math, and in her free time enjoys walking her dog, as well as playing volleyball and ultimate frisbee.

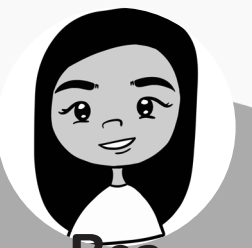
## Esiw the Robot



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



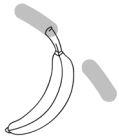
Bea

Mahalia

Michelle

# The Natural Medicine Lab

In a lot of cultures plants, fruits and vegetables were used for medicine to treat people. Below is a list of plants and their uses in different cultures. Use this information to match the sick patient to the plants that will help them heal.



**Plantain - In Indigenous Culture** - were used as a disinfectant to protect cuts. They also help to stop bleeding and can be used on bug bits, and skin conditions like rashes.

**Female Sage - In Indigenous Culture** - is used as a deodorant or mosquito repellant. It is also used in tea to detoxify the body.

**Ginger - In Chinese Culture** - has been used to treat indigestion, upset stomach, diarrhea, and nausea. Still used to this day.

**Lily bulb - In Chinese Culture** - was used to treat dry cough, dry and sore throat, and wheezing.

**Garlic - In Ancient Egyptian Culture** - was routinely given to asthmatics and to those suffering with bronchial-pulmonary complaints. Also used to treat sore throats.

**Honey - In Indigenous and Ancient Egyptian Culture** - was widely used as a natural antibiotic and used to dress wounds.

**Mint - In Ancient Greek Culture** - was used to treat stomach issues, bad bread, and bad sleep.

**Olive - In Ancient Greek Culture** - was used to prevent diabetes, and improve brain function. Olive oil protects against heart issues and strokes.

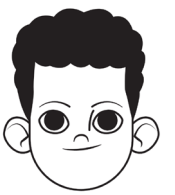


*This activity continues on the next page!*

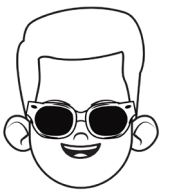
Match Amina, TJ and Jim to the natural medicines that will help treat what ails them.

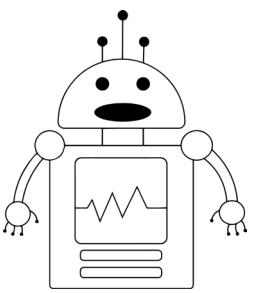
Amina has a sore throat

TJ scraped his knee



Jim has stomach aches





Computers are programmed with the ability to match data to certain users. For example, matching each patient to their healing plant is similar to a computer matching a user's username to their passwords.

# Plant Population Estimation

Have you ever tried to count the number of plants living in a specific area? When that area is large, it is not an easy thing to do. It would probably take too much time to count every single plant in the area, and even if you tried, what if you lost count? You would have to start again from the beginning. Luckily, there is an easier way to estimate plant populations in a natural habitat. We can use something called a sample area.

## Making a Sample Area

A sample area is a small area of land within a habitat. We can count the number of plants in this area and then use that data to estimate the plant population of the larger habitat. Using 4 sticks, 4 meters of string/rope, and a measuring tape, head outside and follow the steps below to make your own sample area!

## Step 1:

Identify a natural habitat near you where you want to estimate the plant population of a specific plant species and fill out these variables. (For the habitat you could use a field by your home, or a backyard, etc. For the plant species, try and find something relatively small that naturally grows within your habitat, such as prairie crocuses in a sandy Manitoba field, or dandelions in a backyard).

**Habitat = (_____)**
**Plant Species = (_____)**

## Step 2:

Take your measuring tape and within your habitat measure a square. Each side should be 1 meter long. Put a stick in the ground of each corner of the 1 by 1 meter square. Then tie the string/rope around each stick close to the ground so you have a square sample area defined by the string.



*This activity continues on the next page!*

## Step 3:

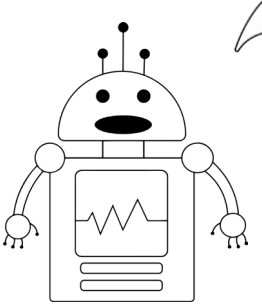
Think about what your plant species looks like and count each one that is growing within the sample area. Then record the number below.

**How many plants were in your sample area? = (_____)**

Identify the plant type you are looking for in your sample area based on its physical appearance. What does your plant look like? Draw a picture below, don't forget to add some colour!

## Step 4:

You can use the number of plants in your sample area to estimate the plant population in the same habitat, but a greater area. The only thing you need to do now is some multiplication!



A variable is something that stores information that can change. Here our variable is X and it represents the number of plants within the sample area. When the population of our sample area changes, so does X!

*This activity continues on the next page!*

An estimation is not designed to be 100% correct, but it should tell us approximately how many plants are in the larger habitat. If you have a habitat that is 3 times larger than the sample area, then you can multiply the number of plants you counted by 3 to get the larger plant population estimate. In the following example, the variable X = the number of plants you counted in your sample area.

**Sample Area** = 1 by 1 meter
**Sample Population** = X
**Habitat Area** = 3 by 1 meters
**Habitat Population** = X multiplied by 3

Now try this with your plant population and habitat by filling in the blanks:

**Sample Area** = 1 by 1 meter
**Sample Population** = (_____)
**Habitat Area** = (_____ **multiplied by** 1 meter)
**Habitat Population** = Sample population **multiplied by** Habitat area

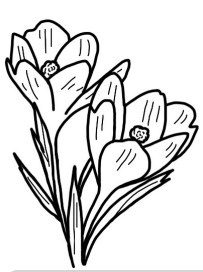
**My Habitat Population** = (_____)

And now you have an estimate of the plant population in your habitat! Plants grow differently depending on how much sunlight, shade, and water they have. What are some things that could make our plant populatoin estimate less accurate, or farther away from the real plant population of a habitat? Record them below:

_____

_____

_____

# Technological Developments That Help Us See

There are many technological developments throughout history that help our ability to see and have also had a major impact on science. Some of these things are very high tech, but there are others that can be quite simple and very effective.

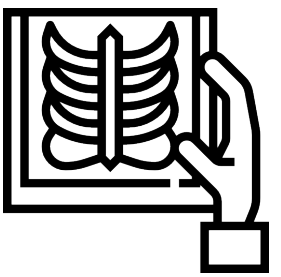
Match up each technological development that helps us see with its correct explanation by drawing a line.

**Binoculars**

1

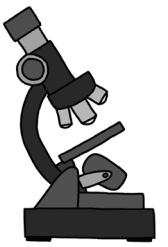
**X-Ray Machine**

2



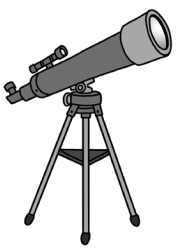
**Optical Microscope**

3



**Telescope**

4



a. This helps us see beyond the Earth and proved to scientists that Earth was not the centre of the universe. It also helped us realize that light radiates from the sun and other stars.

b. These help us see things that are around us at a far distance. For example, birds and animals. They help us observe and study nature without disturbing it.

c. This machine is mainly used to view bone fragments and breaks.

d. This thing uses visible light to magnify images and allows scientists to study and learn more about the microscopic world. This visual tool can magnify between 40 and 2000 times.

SLO: 4-2-13

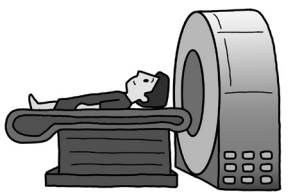
Magnifying Glass

5

e. This optical tool allows doctors to look at the organs and structures inside your body. It also allows healthcare professionals to diagnose patients with a variety of conditions, such as torn ligaments or tumors. This tool is also used for examining the brain.

MRI Machine

6



f. These help correct our everyday vision and make it easier to see and interact with people. They allow the eye to focus light in the right spot on the retina where the clearest image can be produced.

Electron Microscope

7

g. This is a simple handheld obect that is known as the simplest form of a microscope. It makes an object appear larger and more detailed when observing.

8 Changing Contrast to Increase Vision

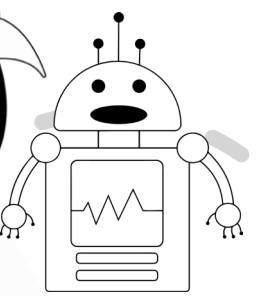
h. This thing uses a beam of wave-like electrons to magnify images, and allows scientists to study and learn more about the microscopic world. Scientists can see things that are more than 1 million times smaller.

Glasses and Contact Lenses

9

i. Increasing the difference between light and dark areas to make an object more visible is a simple, but very effective method to improve vision.

Matching up and finding the correct answer for each of these terms is like debugging a problem in code! Thanks for helping me out!



# Object Classification: Light Edition

Read the following paragraph, then sort these items into their appropriate categories.

Any objects that produce (emit) their own light are called **luminous** objects. Objects that do not emit light are **non-luminous** and some can reflect light, called reflectors, while others absorb it. In this activity, colour the following objects and then write in the chart on Page 12 which object is **luminous** and which are **non-luminous light reflectors**.

Lamp Post

Snow on the ground

A Human Face

A Black Screen

Sunlight

Tablet Screen

Moonlight

Computer



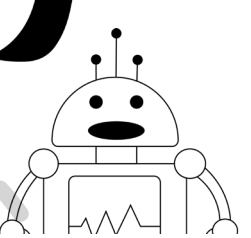
*This activity continues on the next page!*

## These questions will help you sort the objects into the chart:

1. During winter nights, the sky seems illuminated. **Which object emits light and which one reflects it**?
2. The moon illuminates the sky. **Does it reflect light or emit it**?
3. If you are on your tablet at night, your face seems illuminated. **Does your face emit light or does it reflect it**?
4. When using a computer, there is light in the room. **Does the computer emit light or reflect it**? **What about when it's just a black screen (turned off)**?

| Emit Light<br>Luminous | Reflect Light<br>Non-Luminous |
|---|---|
| | |

Sorting is very important in computer science. Defining an object (ex: lamp) as belonging to a set with the same qualities (luminous or non-luminous) is called data classification.



# Engineering Sound Barriers

What is a sound barrier? It's a layer of material that absorbs sound, so loud noises sound quieter. For example, have you ever been walking beside a road and heard lots of noise from passing cars? That's noise pollution. Noise pollution can cause headaches, distractions, and make it hard to focus. Have you ever been inside a building and heard a car drive by outside? The walls of the building absorb some of the noise from the passing vehicle. Walls are sound barriers! What other examples of sound barriers are in your community?

**A sound barrier near my house looks like: _____**
**_____.**
**A sound barrier near my school looks like: _____**
**_____.**
**An interesting sound barrier that I saw looked like: _____**
**_____.**

Now that you can picture some different sound barriers, let's learn about how they are designed. Engineers design sound barriers to reduce noise pollution for people, animals, and around specific noise sensitive locations such as hospitals and schools. Engineers have to think about the materials, shape, and size of the barriers they design. Here are some materials that can absorb sound:

**Concrete** Concrete is made from rocks, sand, and water, and effectively absorbs sound, reducing noise pollution.

**Metal** Metal is dense and can be designed to greatly reduce the amount of noise pollution when used to build sound barriers.

**Wood** Wood is a natural material and is not as effective in reducing noise pollution as concrete and metal, but can still look nice and reduce some noise.

SLO: 4-3-14, 4-3-15

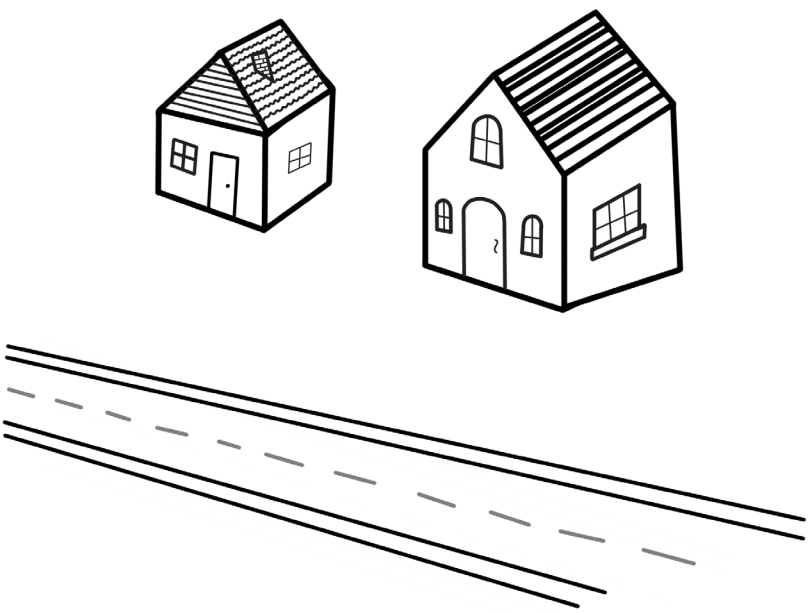
**Greenery**

Trees, bushes, and plants can all be used to absorb sound, but they are not very effective because a lot of sound can still travel through these green materials.

When designing sound barriers, engineers have to consider how well a material will work, and also how it will look. The thicker and denser the material, the better the barrier will work to reduce the signals from the noise. This is like **signal processing** in electrical engineering, where unwanted signals, such as loud noises, are identified and then blocked. Sound barriers block the signals of loud sounds and noise pollution.

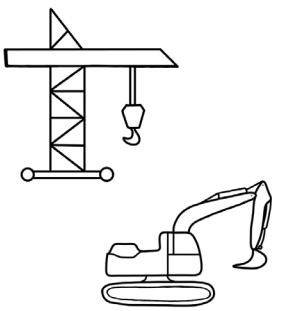
To make them look nicer, you can include designs, patterns, and art on the walls of noise barriers. With these materials and design choices in mind, read each scenario on the following page, and design an appropriate sound barrier. Fill out the barrier questions and then draw a picture of your design!

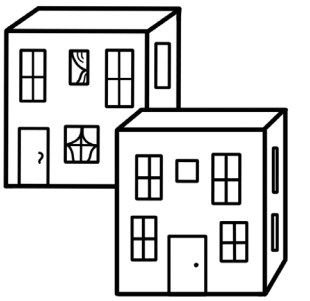
What type of sound barrier would you design to reduce the road noise for these houses? While also giving the residents a nice barrier to look at out their windows? Draw a sound barrier between the road and the homes. Fill in these blanks:



**Barrier shape: _____.**
**Barrier material: _____.**
**Barrier height: _____.**

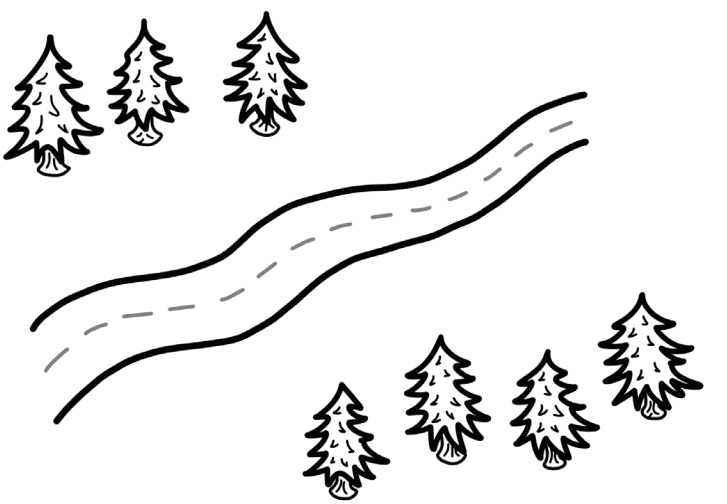
What type of temporary sound barrier would you design to reduce the construction noise for these residential buildings where people live? Can you design your barrier between the buildings and the construction equipment? Fill in these blanks:





**Barrier shape: _____.**
**Barrier material: _____.**
**Barrier height: _____.**

What type of sound barrier would you design to reduce the noise of the highway for the animals living in this forest. Can you design your barrier to also prevent the animals from getting hurt by the highway traffic? Think about the ways that animals could get to the other side of the highway without walking through traffic. Draw a barrier that addresses these two problems.



**Barrier shape: _____.**
**Barrier material: _____.**
**Barrier height: _____.**

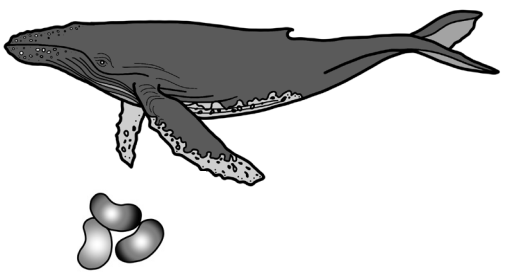
## Can You Hear That Sound?

We use our ears to hear sounds that travel through the air as sound waves. Did you know that different sounds produce different wave lengths? The wavelength is the length of the sound wave. Our ears are only designed to hear some wavelengths, kind of like **signal processing** in electrical engineering. All the sound data is collected by the ears, but only some of the signals can be understood and interpreted. The other sounds are ignored by our ears.

Human ears are designed to hear sounds with wavelengths from approximately 0.017 to 17 meters. That's a big range. 0.017 meters is approximately the length of a jellybean, and 17 meters is the approximate length of a humpback whale!

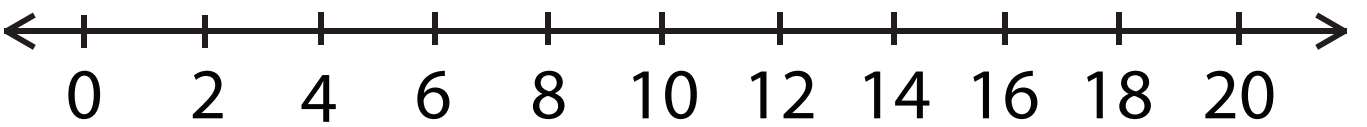
Long wavelengths:

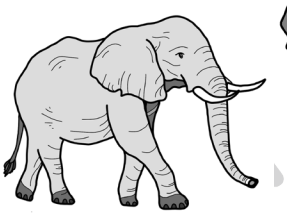
Short wavelengths:

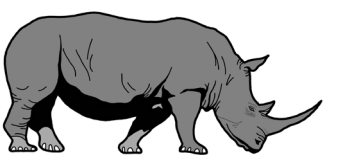


Connect the animals below to the wavelength scale below depending on the noise the animals makes. The scale starts at 0 meters and goes to 24 meters. Remember, if the sound is higher, it will have a shorter wavelength. If the sound is lower, it will have a longer wavelength. Finally, all sounds that humans can hear with their ears are in between 0.017 meters and 17 meters.

Hint: Think about whether or not you have heard the sounds these animals make. Then think about if the sounds were low or high.





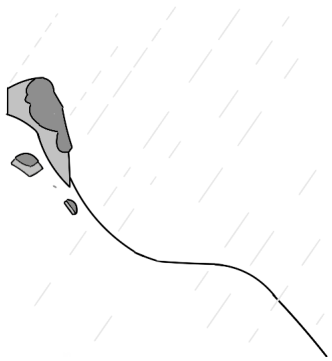


SLO: 4-3-10

## Changes in Landscape

Earthquakes, floods, and other natural disasters have ways of changing the Earth's surface. Given the following inputs in the examples below, draw and write out the output or prediction to determine ways in which the Earth's surface may change. You can draw your answers in the boxes and write out your predicitions.  Will the rocks break down? Trees fall down? How will the climate be affected?

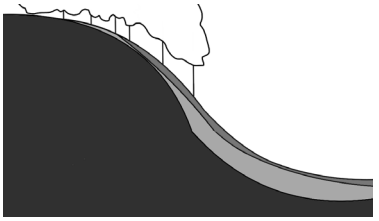
**Floods**



Rock on a hill + Water overflow =

Characteristic changes:

**Mud Slides**



Tree on top of a hill + Heavy Rain Fall =

Characteristic changes:

## Forest Fires

Forest

+

Fire

=

Characteristic changes:

## Avalanches

Snowy Mountain

+

Snowfall

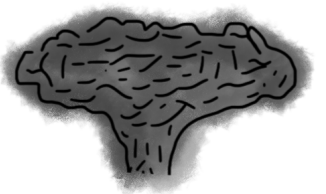
=

Characteristic changes:

## Volcanic Eruptions

Volcano

+



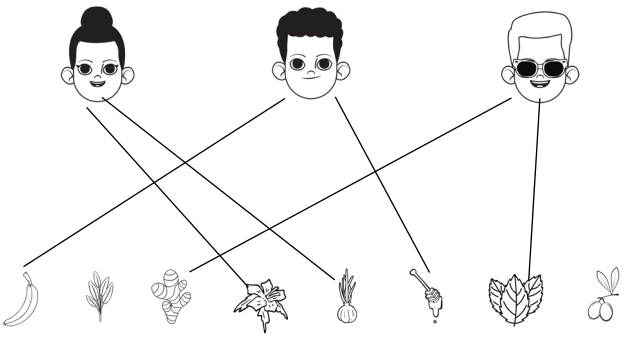
Ash Cloud

=

Characteristic changes:

## Answer Keys

### 4-5 - The Natural Medicine Lab



### 9-10 - Technological Developments That Help Us See

1. B
2. C
3. D
4. A
5. G
6. E
7. H
8. I
9. F

### 11-12 - Object Classification: Light Edition

Emit Light: Lamp post, sunlight, Tablet Screen, Computer.

Reflects Light: Snow on the ground, Moonlight, A Human Face, A Black Screen.

### 16 - Can You Hear That Sound?

1. Echolocation < 0.017 (Bat)
2. 0.017 m < Meow < 17 m (Cat)
3. 0.017 m < Squawk < 17 m (Toucan)
4. 0.017 m < Bark < 17 m (Dog)
5. 17 m < Rumble (Rhinoceros)
6. 17 m < Rumble (Elephant)

Note: These answers are approximate and based on whether or not the animal noise is audible to the human ear.

### 17-18 - Changes in Landscape

**Floods**: Rocks break down and move to a new location. Rocks can also change appearance, becoming more smooth
**Mud Slides**: Wash away land. Dirt, mud, rocks, and boulders slide down the hill, flatten the land. Rock break down and relocation
**Forest Fires**: Removal of trees, increased carbon (C02) emissions thus warming up the planet, increased soot/ash, and loss of wildlife
**Avalanches**: Snow, rock, ice and soil slide down a mountain, destruction of trees
**Volcanic Eruptons**: Molten rock or magma escapes creating rock formation or mountains

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