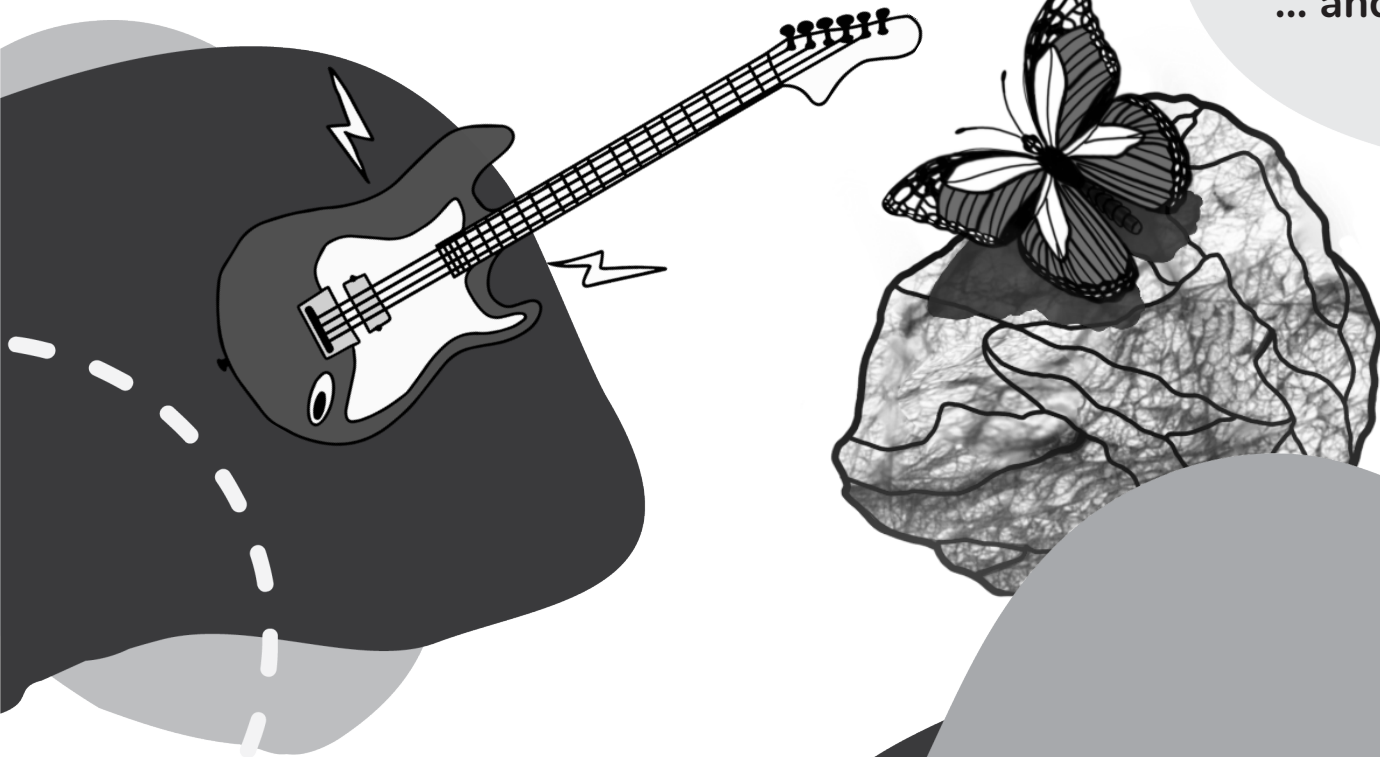


WISE Activity Booklets

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

DIY Activities
Puzzles
Challenges
... and more!



University
of Manitoba

WISE Kid-Netic Energy is a proud member of Actua

A network
member of
actua.ca

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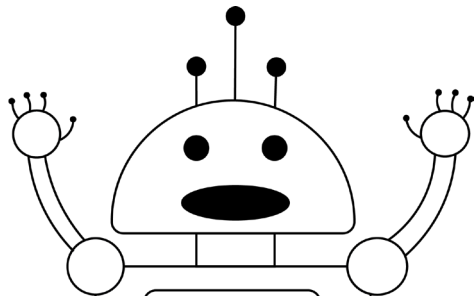
Youth · STEM · Innovation

With funding from

Canada

Grade 4
AUGUST 2020

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



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.

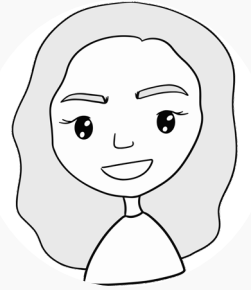
We hope that you enjoy doing the experiments and activities as much as we loved creating them for you.

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**

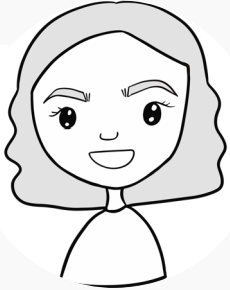
P.S. If you have any suggestions for activities or experiments you would like us to try, contact us through our website, or social media accounts that are listed on the last page of this booklet.

Meet our Amazing Authors!



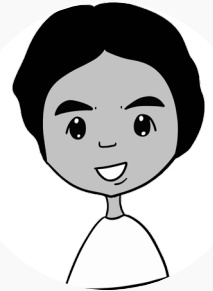
Amelia

Amelia just completed her first year of the after-degree program in early years education. When she isn't reading, she loves writing lists, running, having quality conversations with friends, knitting and singing show-tunes.



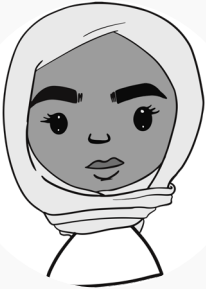
Brenna

Brenna has finished her second year of mechanical engineering and loves science, especially physics! In her free time she likes to paint or draw, see friends, and play with her dog.



Olivia

Olivia is going into her third year of biosystems engineering. She hopes to work in renewable energy or water treatment in the future. In her free time, she plays and refs touch football and enjoys playing the piano.

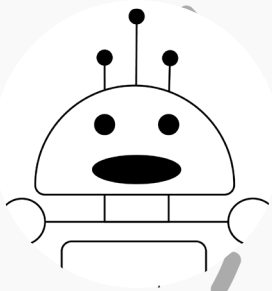
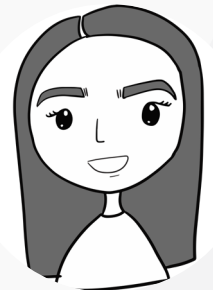


Reem

Reem has finished her first year of science at the U of M and her favourite classes are psychology and microbiology. In her free time, she loves to watch movies and bake desserts.

Shannon

Shannon has finished her first year of Engineering. In her spare time she enjoys drawing, exercising, being outdoors, and trying new things. She is super pumped to be a part of WISE for the summer!



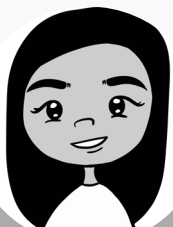
Esiw the Robot

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



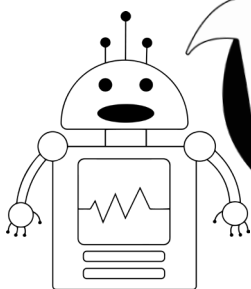
Michelle

What Kind of Energy?

Most processes in the world use some form of energy. Whether it be cooking, a speaker blaring music, or x-rays, there are many different forms of energy. Energy cannot be created or destroyed, (it must come from somewhere!) so many processes also involve transforming one energy type to another.

Read each sentence and figure out what kind of energy is involved (and if applicable, whether there is a transformation from one energy type to another). Choose from: light energy, sound energy, thermal energy (heat), chemical energy (eg. food), mechanical energy (motion), gravitational energy, and electrical energy.

- 1 Kakeka went fishing and caught some trout. She wants to cook it for her family. What kind of energy does cooking require?
- 2 Sam lives in a very sunny spot and wants to power their house. They decide to use a renewable source of energy, solar panels! What is the energy conversion here?
- 3 Throckmorton the skateboarder is jamming out on instruments with his friends. What kind of energy does this use and produce?
- 4 Simone and Cassie went birdwatching one night, where they saw an owl hunting for mice. What kind of energy is the owl looking for?
- 5 Hope hurt her leg and thinks it's broken. She goes to get an x-ray done. What kind of energy does the x-ray make use of?
- 6 A rock falls into a pond and causes ripples. What is the energy conversion here?
- 7 Chyanne and Mason are going bungee jumping! What kind of energy is acting here?

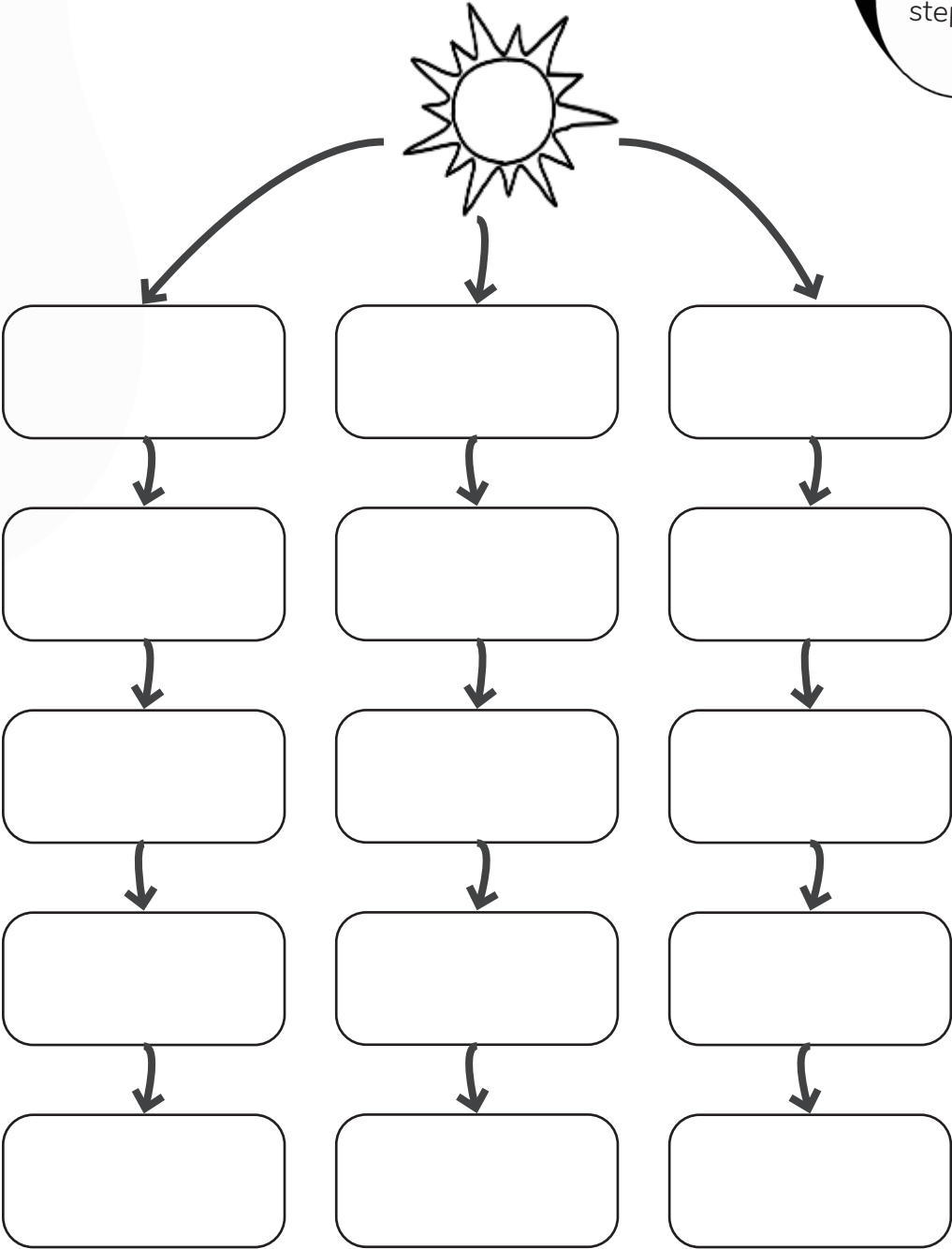
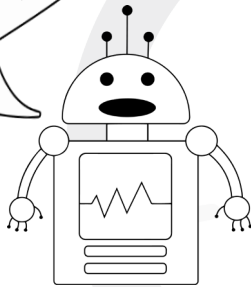


Computers use electricity, a form of energy, and convert it into different forms of energy. A computer screen produces light energy, speakers produce sound energy and circuitry produces heat energy. That's why computers have a fan, in order to cool it off.

Food Chain

Let's see whether you can track energy flow in your own environment! Go outside and observe your surroundings. When you see an animal, like a bird, ant or squirrel, add them to the food chain in the place where you think they fit best. Fill in the rest based on what that animal eats (or what eats it)! Eg. A tree gets energy directly from the sun, and is a "producer". Caterpillars eat tree leaves to get energy, so they are "primary consumers".

Just like a computer program, the food chain must follow a specific sequence in order to work. The caterpillar can't get its energy straight from the sun just like a computer program can't skip steps.



PRODUCERS: Things that use the sun's energy to make their own food energy.

PRIMARY CONSUMERS: Eat producers to get energy. Herbivores or omnivores.

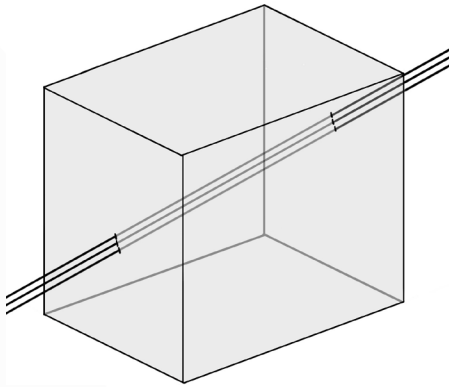
SECONDARY CONSUMERS: Eat primary consumers. Omnivores or carnivores.

TERTIARY CONSUMERS: Eat secondary consumers for energy. Usually carnivores.

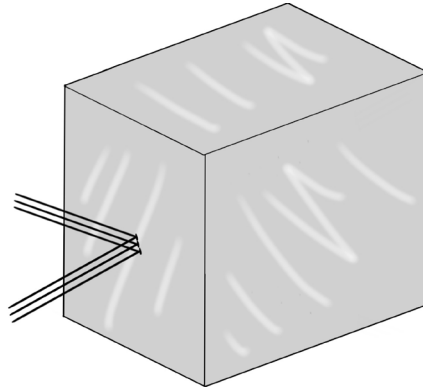
APEX PREDATORS: Top of the food chain. When they die, their bodies decompose and energy returns to the first level.

Reflection Maze

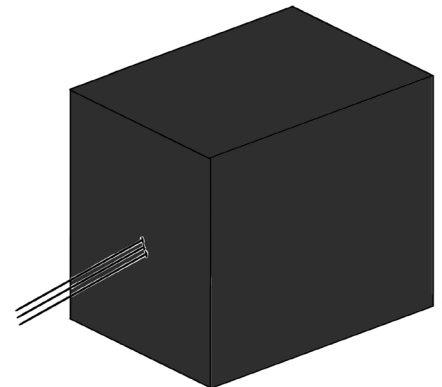
Light is all around us – it's how we see everything! Light is a form of energy that travels in a straight line, but different materials can change its movement.



Light will pass through transparent objects

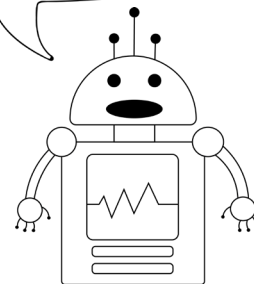


Light will be reflected by smooth and shiny objects. Light will always reflect off an object at the same angle that it hit at.

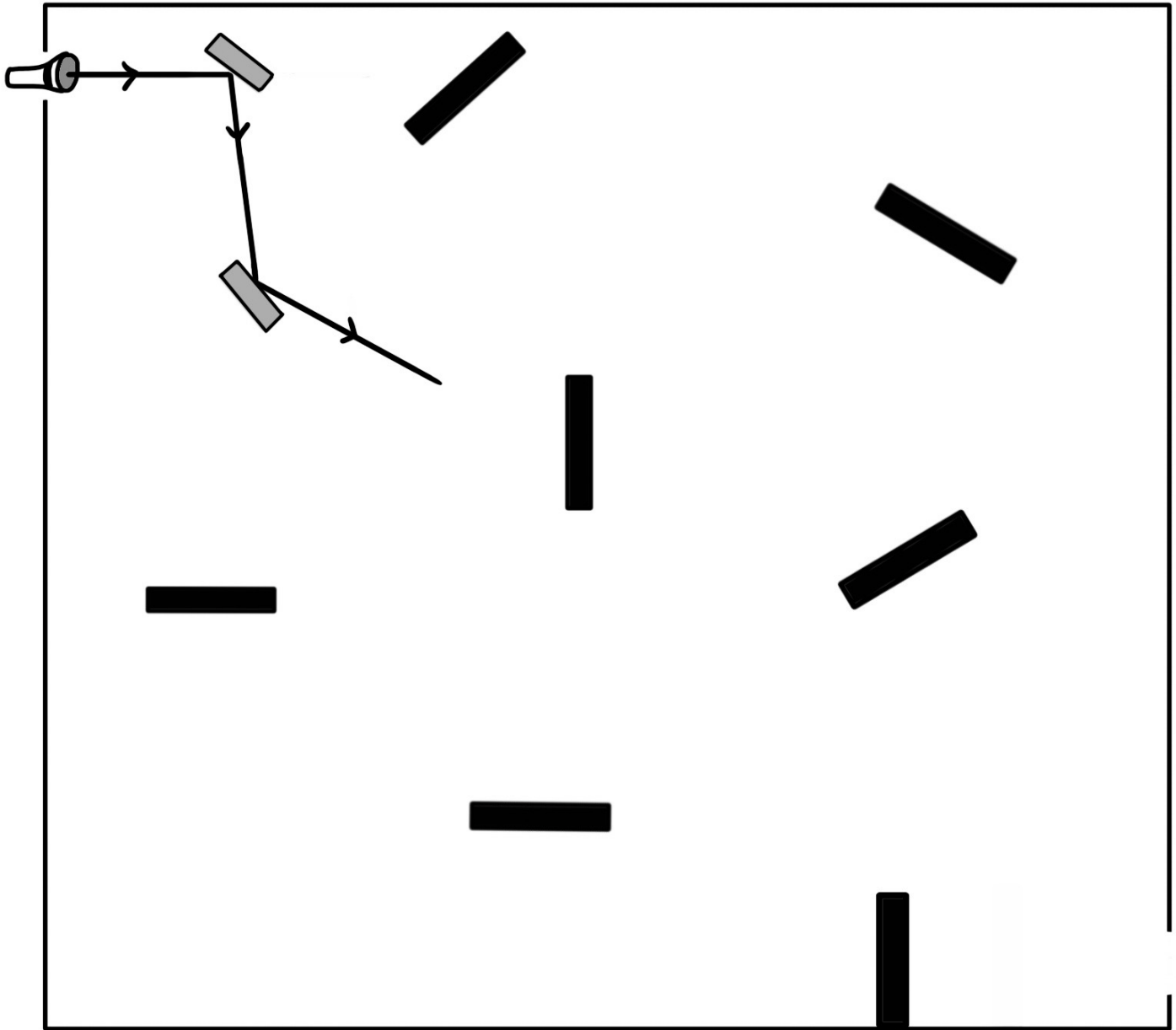


Light will be absorbed by solid black objects

We can compare the changes in light movement to **functions** in computer code! Functions handle data inputs in specific ways to produce a certain output. In light movement, the original beam of light is like the input, how the material changes the light is like a function, and the reflected / absorbed / unchanged light is like the output.



Can you add mirrors to the maze below so that the light will bounce around and reach the other end? Avoid the black blocks that will absorb the light and end your light beam!



Ear Maze

Help the sound vibration find its way to the brain. Sounds are caused by vibrations that move in the form of waves. Before a sound can be processed by the brain, the sound vibration moves from the outer ear, to the middle ear, and then through the inner ear.

SOUND VIBRATION (START) ((⊕))



OUTER EAR



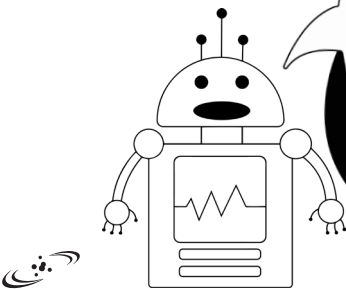
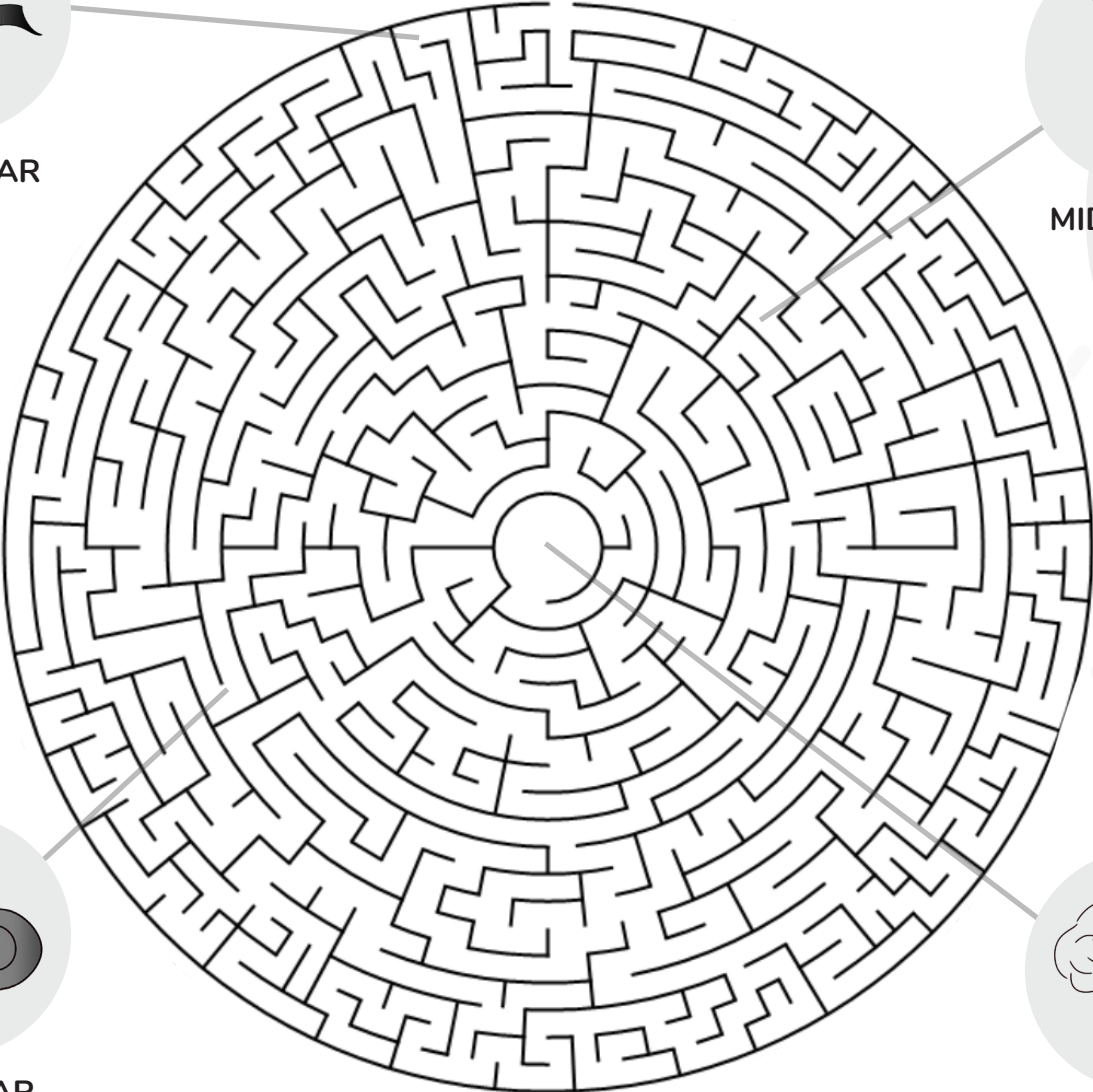
MIDDLE EAR



INNER EAR



BRAIN



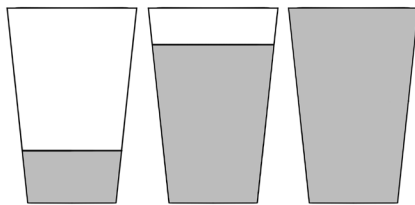
Completing a maze like this requires the use of computational thinking concepts such as logic and evaluation. You have to predict which path is correct and make judgements as you travel through the maze. Logic and evaluation are ideas that are used by computers to process information. Now, think like a computer and get the sound vibration to the brain!

Decode A Song

Let's play a song with glasses of water! Adding water will change the vibration of the glass and create different pitches, so you hear the notes of a song. Pitch describes how high or low a sound is. This depends on the frequency of the sound waves. If the frequency of vibration is higher, we say that the sound has a high pitch - think of a flute for example! If the sound has a very low pitch, like a tuba, it has a much lower frequency.

Try filling glasses of water to the levels indicated for each song. Then, follow the song "code" from top to bottom, tapping the glass with a metal utensil to play each note.

Here Comes the Sun (by The Beatles):



2/3 full

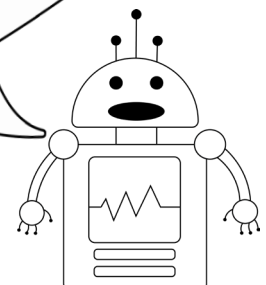
3/4 full

full

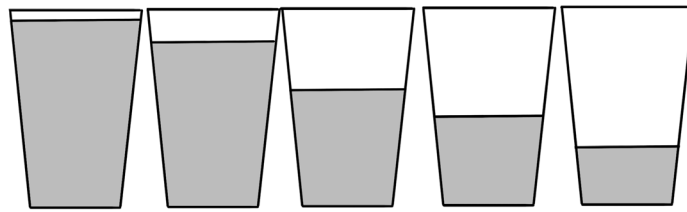
1	0	0	Here
0	1	0	comes
1	0	0	the
0	0	1	sun
1	0	0	doo
0	0	1	doo
0	1	0	doo
1	0	0	doo
1	0	0	Here
0	1	0	comes
1	0	0	the
0	0	1	sun
0	0	1	and
0	1	0	I
0	0	1	say
1	0	0	It's
0	1	0	al-
0	0	1	right

NOTE: the measurements for each water level aren't exact! You can add more water to make the glass a lower pitch or use less water to make it a higher pitch. This will help you adjust the sounds and make the song more accurate.

The songs are written out in **binary**, which is how computers understand information! "1" is for yes/true/on, and "0" is for no/false/off. The lines of binary 1's and 0's match up with the glasses and tell you when to hit each one. I recommend gently tapping the side of the glasses with a metal fork or spoon to play the notes.



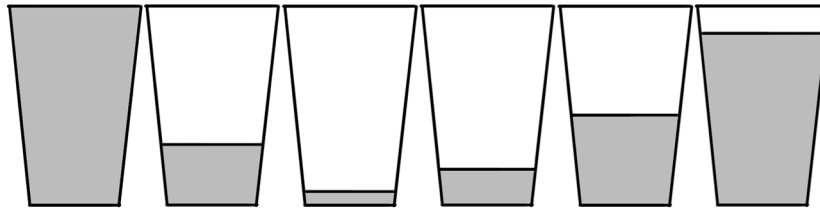
Under the Sea (from Disney's The Little Mermaid):



almost full almost almost full 2/3 full between 1/3 and 2/3 full 1/3 full

0	0	0	0	1	Un-
0	0	0	1	0	der
0	0	1	0	0	the
0	1	0	0	0	sea,
0	0	0	0	1	un-
0	0	0	1	0	der
0	0	1	0	0	the
0	0	0	1	0	sea!
0	0	0	0	1	Dar-
0	0	0	1	0	ling
0	0	1	0	0	it's
0	1	0	0	0	bet-
1	0	0	0	0	ter
0	0	0	0	1	down
0	0	0	1	0	where
0	0	1	0	0	it's
0	1	0	0	0	wet-
1	0	0	0	0	ter,
0	0	0	0	1	take
0	0	0	1	0	it
0	0	1	0	0	from
0	0	0	0	1	me!

Twinkle Twinkle Little Star:

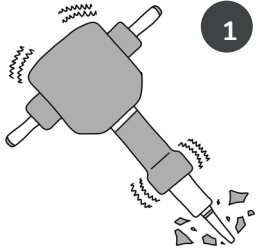


full 1/4 full almost empty 1/8 full 1/3 full almost full

1	0	0	0	0	0	Twin-
1	0	0	0	0	0	kle
0	1	0	0	0	0	twin-
0	1	0	0	0	0	kle
0	0	1	0	0	0	lit-
0	0	1	0	0	0	tle
0	1	0	0	0	0	star
0	0	0	1	0	0	How
0	0	0	1	0	0	I
0	0	0	0	1	0	won-
0	0	0	0	1	0	der
0	0	0	0	0	1	what
0	0	0	0	0	1	you
1	0	0	0	0	0	are.
0	1	0	0	0	0	Up
0	1	0	0	0	0	a-
0	0	0	1	0	0	bove
0	0	0	1	0	0	the
0	0	0	0	1	0	world
0	0	0	0	1	0	so
0	0	0	0	0	1	high,
0	1	0	0	0	0	like
0	1	0	0	0	0	a
0	0	1	0	0	0	dia-
0	0	1	0	0	0	mond
0	0	0	0	1	0	in
0	0	0	0	1	0	the
0	0	0	0	0	1	sky

Hearing Protection

Consider the following scenarios, and see whether you can make the best choice for your hearing! Use the chart on the next page to help you.

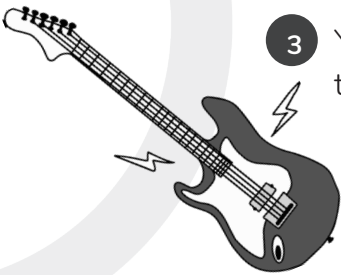


1 Your aunt is a construction worker and uses a jackhammer frequently. She asks you to grab her some ear protection, so you grab the...

- a Fuzzy earmuffs
- b Professional ear protections
- c Headphones

2 You just got a new blender and its really noisy. You should...

- a Not worry, this could only cause hearing damage after long exposure
- b Only make smoothies when you have ear plugs in
- c Avoid using the blender for more than 2 minutes at a time



3 Your uncle is going to a notoriously loud rock and roll concert. You should tell him to...

- a Bring a helmet
- b Bring a jolly attitude
- c Bring ear plugs

4 It's raining outside and you can hear raindrops loudly hitting the roof. You should...

- a Wear ear plugs and hide under a blanket
- b Avoid leaving your house to protect your ears
- c Nothing! This is a safe volume of sound



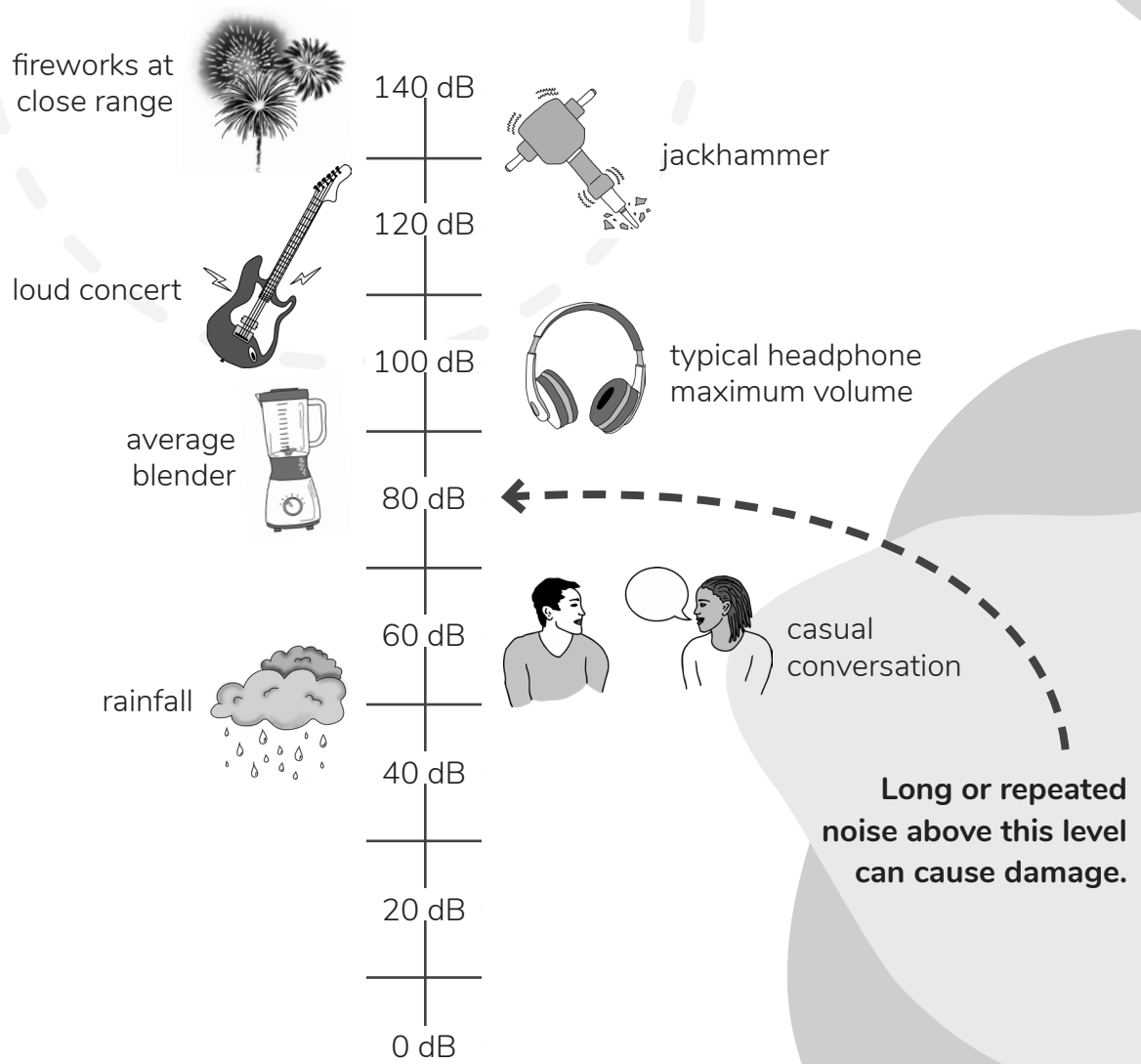
5 Your older sister just bought a new pair of headphones to listen to Harry Styles's new album... what should she do?

- a Listen to the album at full blast and shout all the words
- b Listen to Ariana Grande instead
- c Listen with the headphones at a moderate volume

6 The park likes to set off some cool fireworks, at which distance should you watch the display from...

- a As close as possible to the set off point to get the best view
- b An appropriate distance (at least 150 meters) away
- c An appropriate distance (at least 100 km) away





→ SCIENCE OF HEARING

Sounds that are too loud can damage the tiny hairs inside of your ear and once they are damaged, they cannot regrow or be repaired. It is important to be able to identify safe volume levels that won't damage your hearing.

TINNITUS is a ringing sound heard after experiencing hearing damage. 90% of people who have had long exposure to loud sounds develop tinnitus.

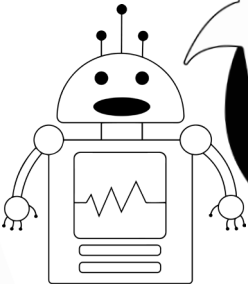
LOUDNESS is the intensity or amount of energy measured in **decibels (dB)**.

For a sound increase of 10 decibels, the sound intensity goes up 10 times. In other words, a small increase in decibels means a much, much bigger increase in loudness!

Another important factor is how long you are exposed to the sound. The higher the decibel number, the less time you can be exposed to it without getting hearing damage.

Design A Rock

Use the different characteristics below to design your own rock. (In reality, rock formation is linked to the geology of specific places, but in this activity you can use your imagination to come up with a story for how that rock might have come to be). Rock on!

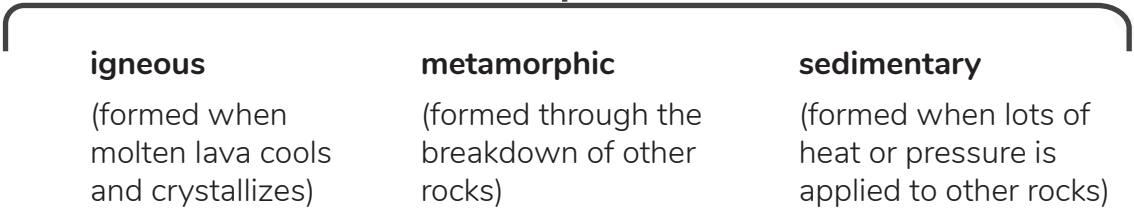


This activity uses **conditional statements**. As you decide what your rock looks like, you must follow the conditions outlined below for the information to be true. Computers use conditional statements all the time. **IF** the conditional statement is true, then the computer will complete the action. **ELSE** the conditional statement is false, the computer will do something else.

For each category, circle the option you would like to pick for your rock! Some choices will affect options that are available to you for other categories, so choose carefully.

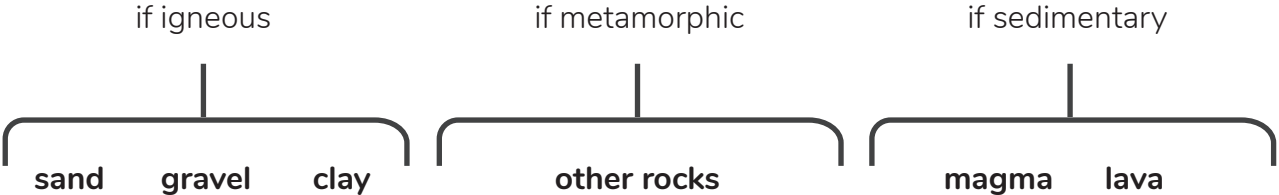
ROCK TYPE

There are 3 main ways rocks can form



COMPOSITION

The way your rock was formed will decide what it is made of.



WEATHERING

A process that causes the texture of the rock to change

physical

(from temperature changes or the impact of water, rain or snow)

chemical

(from acids or salt)

biological

(caused by plants, animals and humans)

TEXTURE

Different types of weathering will be more likely to cause different surfaces

if physical weathering

smooth

split into pieces

if chemical weathering

grooves

holes

if biological weathering

moss growth

lichen growth

plant growth

BONUS QUALITY

Optional qualities to make your rock extra-special!

if igneous

very old

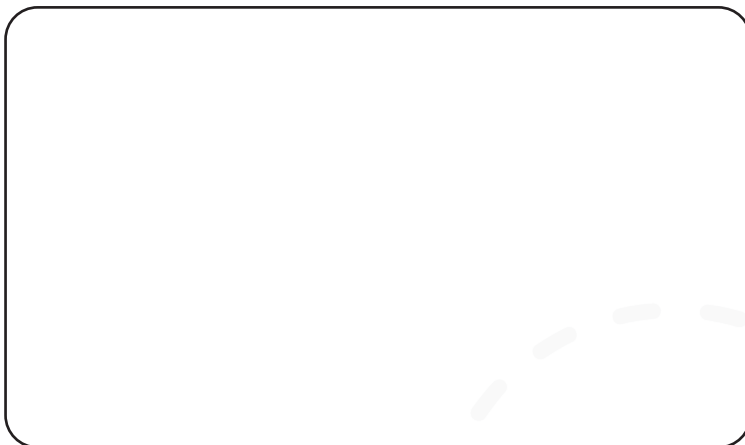
if metamorphic

mineral crystals

ptygmatic folding
(looks like a snake is coming out of the rock surface)

if sedimentary

contains a fossil

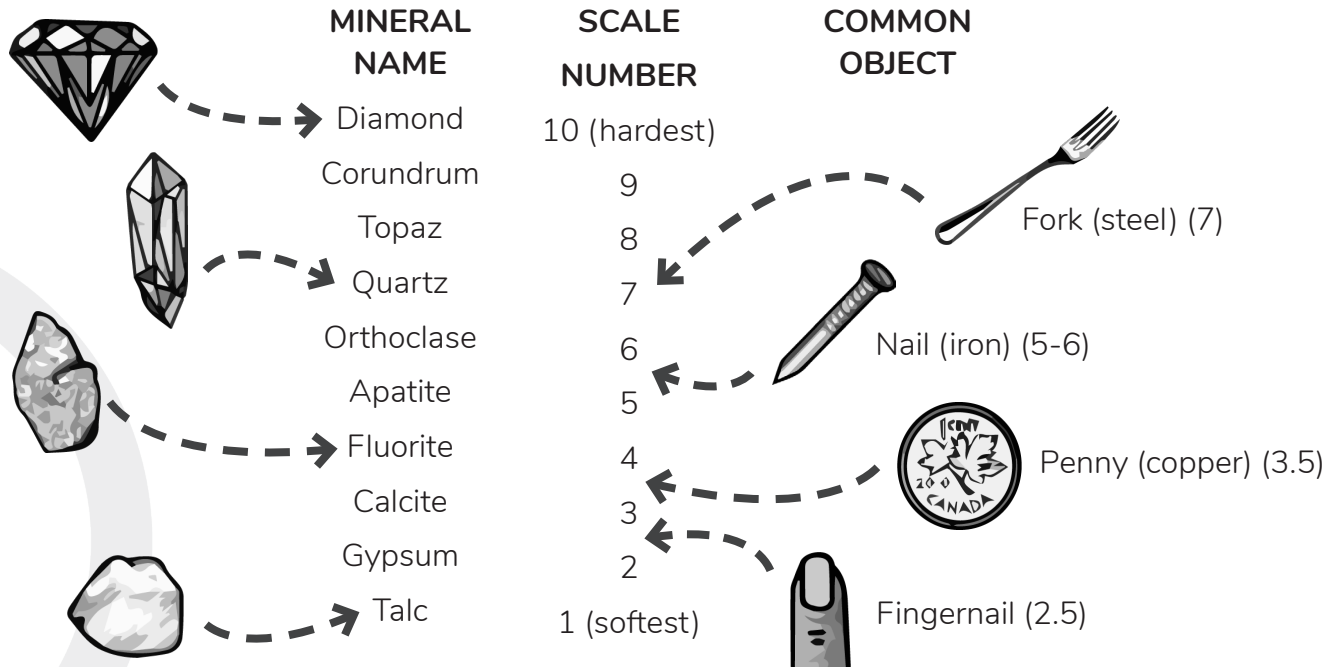


Rock name: _____

Draw a picture of your rock, and give it a name! In your drawing, consider other qualities your rock might have and how this might link to the story of how it was formed: colour, shape, hardness (and check out the next page for an activity all about rock hardness!)

Scratch Test

Hardness is a measure of how tough a material is. Harder materials are more difficult to cut than softer ones. In this activity, we'll be scratching objects to classify their hardness!



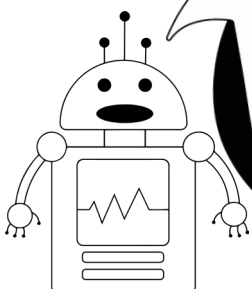
- 1 Go on a hunt around your house or neighbourhood to find a variety of rocks to test. Also gather as many as the “Common Objects” as you can to use as your testing materials.
- 2 Grab your rock and locate a smooth surface on it. With one hand, hold the rock firmly against a table. Hold one of the test materials in the other hand and with firm pressure, drag the testing material across the surface of the rock.
- 3 Take a look at the rock. With a finger, brush away any dust that may have been produced. Did the test produce a scratch? A scratch will be a distinct mark that doesn't go away when you wipe it.
- 4 Do the test a second time to see if the same thing happens.
- 5 If you don't have a scratch, that means your rock is harder than the material you're using to scratch. Therefore, grab the next harder object and repeat the tests.
- 6 Continue to do this until a scratch is produced. Now you can classify how hard your rock is! The hardness of your rock is the number lower than the hardness of the test material that scratched it (eg. if the fork scratched your rock, the hardness of your rock would be a 6).

TIPS:

- Start on the soft end of the scale and work your way up (meaning start with your fingernail, and if it doesn't scratch, move on to the next material).

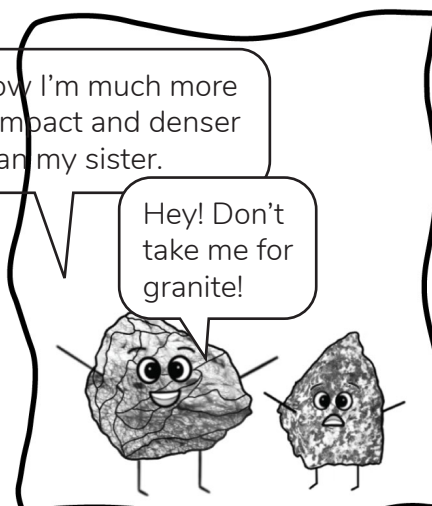
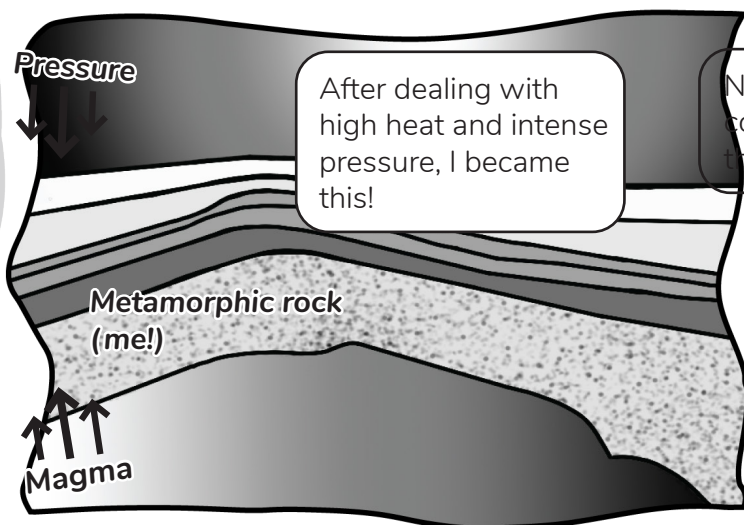
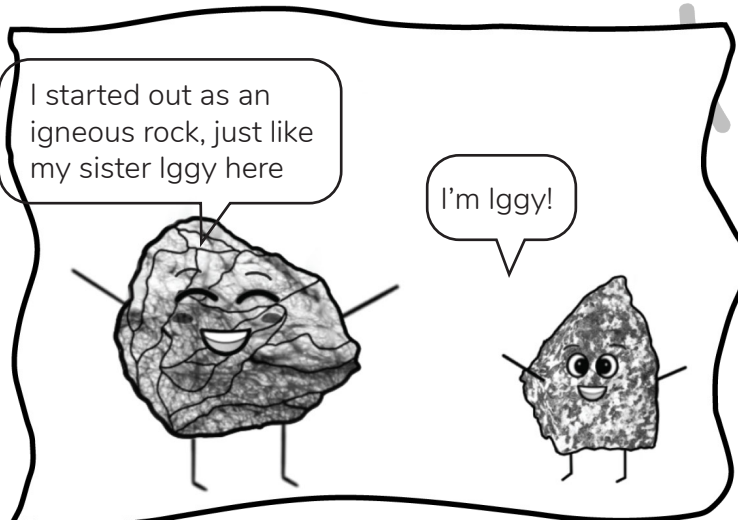
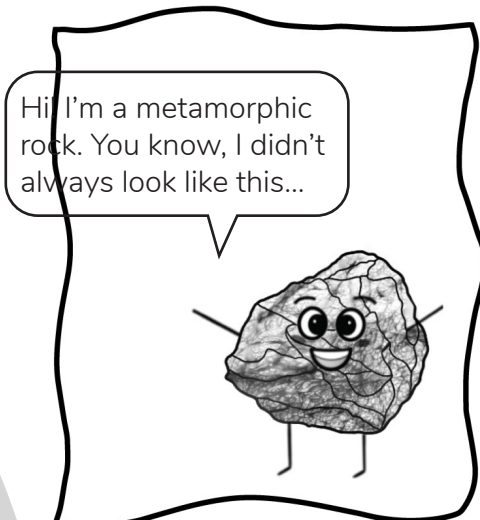
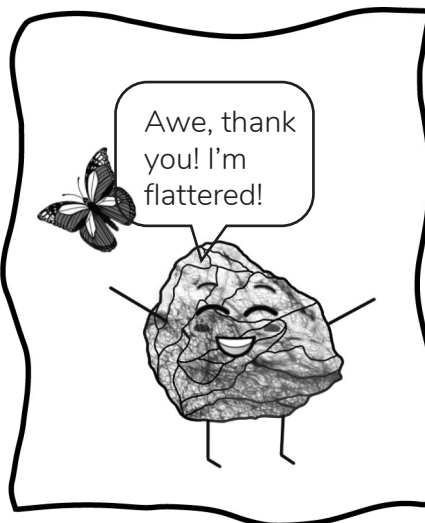
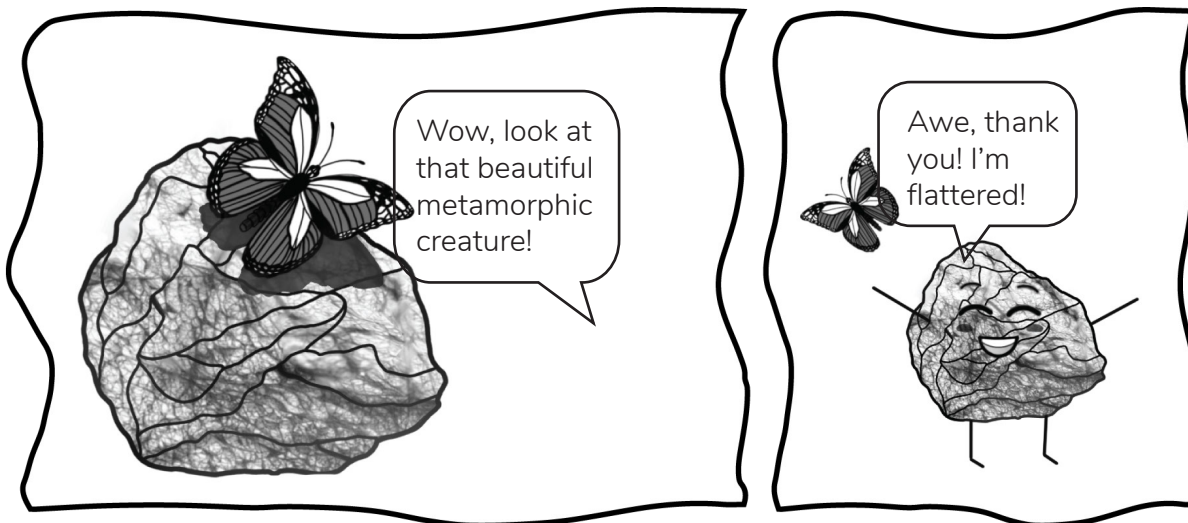
- After scratching, use a magnifying glass or lens to get a good look at what happened!
- After you do your test, make sure to wipe wherever you did the test on your rock with your finger. Sometimes it looks like a scratch is made, but it will disappear when wiped!

<p>ROCK #1</p> <p>Materials that scratched my rock:</p> <p>Materials that didn't scratch my rock:</p> <p>Based on what materials did and didn't scratch my rock, how hard is the rock? _____ mohs</p>	<p>Drawing:</p>
<p>ROCK #2</p> <p>Materials that scratched my rock:</p> <p>Materials that didn't scratch my rock:</p> <p>Based on what materials did and didn't scratch my rock, how hard is the rock? _____ mohs</p>	<p>Drawing:</p>
<p>ROCK #3</p> <p>Materials that scratched my rock:</p> <p>Materials that didn't scratch my rock:</p> <p>Based on what materials did and didn't scratch my rock, how hard is the rock? _____ mohs</p>	<p>Drawing:</p>



Hardness? As a robot, I deal with **hardware**. Hardware are the parts that make up a computer, such as a memory (the brain of the computer) or the motherboard (the heart of the computer). In order for hardware to work, it needs **software**. Software is a set of instructions that tells a computer what to do or how to perform a task. On the next page you'll find the "software" to test your rock's hardness!

Rock Comics - Part 2: Metamorphic



Check our next issue for Part 3: Sedimentary

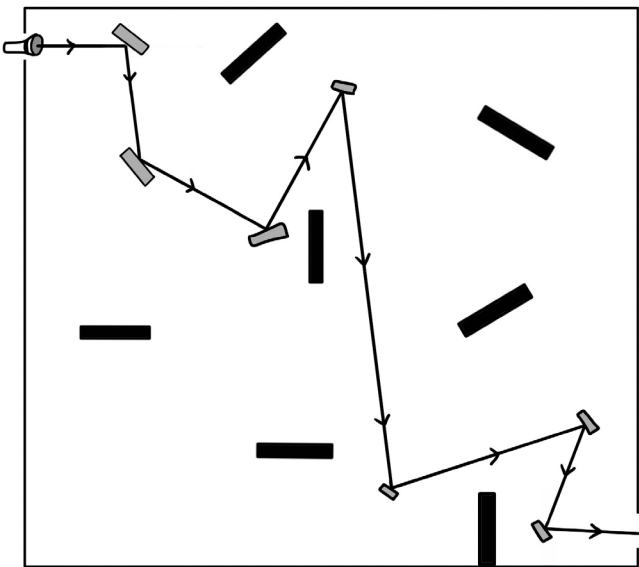
Answer Keys

4 - What Kind of Energy?

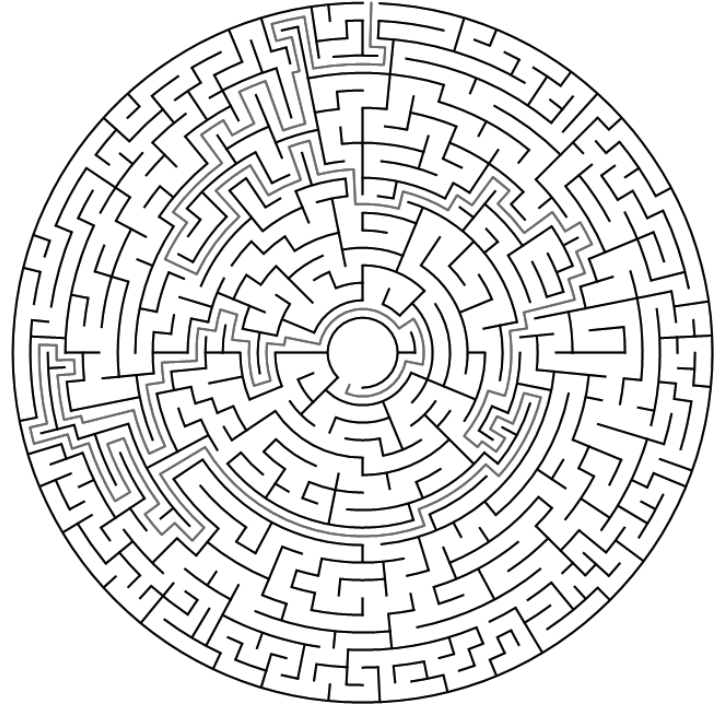
- 1 Thermal (Heat) Energy
- 2 Light Energy to Electrical Energy
- 3 Mechanical Energy to Sound Energy
- 4 Chemical (Food) Energy
- 5 Light Energy
- 6 Gravitational to Mechanical Energy
- 7 Gravitational and Mechanical Energy

7 - Reflection Maze

There are many possible solutions that could be drawn, but here is an example:



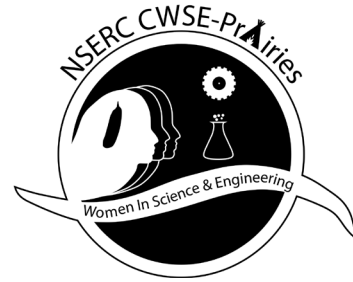
5 - Ear Maze



12 - Hearing Protection

- 1 B **If you got 5-6 correct:** Congratulations! You're a star at protecting your hearing, keep up the great work!
- 2 A **If you got 3-4 correct:** Good job, you have a pretty solid understanding of sound safety! Try to remember what you've learned today to be even better.
- 3 C
- 4 C
- 5 C **If you got 0-2 correct:** It seems you need to be more careful to protect your ears! You can read over this activity to help you remember proper safety.
- 6 B

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