



**WELCOME TO THE
GEOLOGY STATION!**

THE UNITED THANK OFFERING PRESENTS:

GRATITUDE ROCKS!

A Vacation Bible Camp Curriculum Focused on Gratitude, Geology, & Fun

WELCOME!

Thanks for signing up to run the Geology station for camp! You don't need to be a geologist to run this station, just someone who is curious about the world around you and wants to encourage campers to be curious too. If rocks are something you're passionate about, we hope you'll bring your own ideas and creativity to the process as well. Each day you'll walk students through an experiment or activity that helps them engage with a concept from geology. We'll even help you connect that concept to the theme of the day.

Here's a quick look at your week ahead:

Day One: The Rock Cycle

Activity: Pan for rocks and pick your favorite!

Note: These rocks will be used by other stations during the week.

Day Two: Metamorphic Rocks & Pressure

Activity: Confetti poppers- powered by increasing the pressure

Day Three: Igneous Rocks & Volcanos

Activity: make volcanos and watch them erupt with the STEAM station

Day Four: Sedimentary Rocks & Weathering

Activity: Fossil Presentation - requires some planning ahead!

Day Five: Minerals & Gemstones

Activity: Break Open Geodes

We've also given you information on how to expand the activity for different age groups or fill time if a group gets done quickly. You'll have a handout for each day of the week to guide you through the process.

SETTING UP YOUR STEAM STATION:

CREATE THE MOOD

We recommend setting up your station like a lab. This helps remind campers that they need to be careful and aware of their surroundings. You might want to have goggles for everyone to borrow or lab coats.

TOOLS YOU'LL NEED

You will need in your space:

1. Tables for doing experiments on
2. Trays for each student to contain their experiments
3. Decorations - you can put up the posters on the next few pages or print out cool photos of fossils and rocks.

SENSORY NOTES

This is a place where it is easy to get excited, and when we get excited, we sometimes get loud. It is important to remind campers that they are scientists at your station. If you have a camper with sensory issues, be sure to give them a space to work where they have some space if they need it.



WHY GEOLOGY?

You might be wondering why you are teaching science at camp...well, it's because science is fun (and important) and many schools cannot afford a science program that give kids hands-on experience with science. This station teaches critical thinking, problem solving, and exposes them to the scientific method.

The experiments are intended for children to do them unless specified. This is sometimes a hard thing for junior counselors because they want to do the experiment themselves, so if you've got older students helping at this station, we recommend that you meet with them to do the expansion experiments and the one for the day so they are less likely to take over the experiment from the campers.

GRATITUDE ROCKS!

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DAY ONE: PAN FOR ROCKS



Today we are learning about the rock cycle so today and we're going to load kids up with rocks that they will use in a variety of stations throughout the week to complete crafts, gratitude projects, and more. You're going to want to set up this activity outside because it features a process that lets kids pan for rocks. This is a messy activity, but a favorite. What we love about this activity is that all of the rocks will get used, because there's nothing worse than trying to figure out what to do with a bag of rocks!

We've given you two posters (these are the same as the STEAM station) that show the rock cycle and different kinds of rocks to help orient campers.



DAY ONE: THE ROCK CYCLE

SUPPLIES

You will need for each camper:

- sand sifter/sieve
- rocks and sand (variety of sizes, small are great for one of the crafts, approximately 1-1.5 pounds of rocks per camper, we recommend giving each camper a bag of sand and rocks to try to keep the amount of rocks they find about the same)
- ziplock bags with campers names
- handout
- small boxes/bags for the special rock

For the Station:

- large buckets/tubs (for each student) or kiddie pools
- sand
- water
- crayons/colored pencils/markers
- big box to put the bags for each small group

Note: this is one of the most expensive activities at camp this week. There are a couple of ways to do this project:

1. You can buy mixed bags of rocks and then a bag of sand and make your own mix.
2. You can buy pre-mixed bags of sand and rocks online or at a local rock shop.
3. You can buy strainers or you can use disposable pie tins that you have punched holes into.

The goal is to collect all the rocks, so even scrap rocks are great for this activity. You do not need polished or special rocks, just fun colors, shapes, and sizes.

EXPANSION

Most of the rock kits will come with a rock identification sheet that shows what rocks are in the kits. For older campers, you can use this as a worksheet to help them name and ID the rocks along the way. This will help them start to name and identify some of the rocks they are finding along the way. We've also made two versions of the "all about my rock" handout that has more challenging questions for older campers.

SCAFFOLD

This activity is perfect for all ages, and there's not really a need to simplify it. With that said, you may need to help younger campers make sure they got all of their rocks if your mix includes small rocks (which will be helpful for a later craft so you don't want to leave those behind!)

We've made a simplified version of the "all about my rock" handout for those that aren't writing much yet. This will allow them to draw and use colors to describe their rock.

TEACHING ABOUT ROCKS



Set Up for the Day

Have handouts ready for each group, they will need a version of the “all about my rock” handout that best fits their abilities. Set up an area outside where campers can use water to pan for rocks. You can do this using kiddie pools or large buckets/tubs filled about halfway with water. (If using buckets, make sure your sieve fits easily inside the bucket with your hand so campers can lift them in and out.) Since these rocks will be used in other stations, have ziplocks with campers names on them and a box to put the bags into to hand off to the gratitude station leader at the end of the day.

Pan for Rocks

Today in geology we’re going to kick off our week focused on rocks by finding some rocks we’ll use throughout the week! We’re going to pan for rocks using these sieves or sand sifters and water to help discover treasures. Each of you will get a bag that is filled with rocks and sand. A long time ago, people would use this same technique in rivers to look for precious stones like gold. The water would help wash away the dirt and mud to reveal gemstones and other items they could sell.

You are going to put some of your sand and rock mixture into your sieve and then put it partially into the water and sort of shake it a bit. The goal is to get all of the sand to go through the holes in the sieve and leave behind your rocks without them falling into the bucket. You are going to collect your rocks in the ziplock bag with your name on it. This will go to your Rock Formation Leaders because you’ll need them for crafts later. Make sure you save all rocks - big and small, because you’ll need both sizes later this week for different activities.

Pick Your Favorite

Now that you each have a big pile of rocks, I want you to look through all of them again and pick your favorite. You are going to put this rock in this special bag/box. I’ve got this special handout that you’re going to use to describe why your rock is special. This rock and your handout can go home with you today.



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ALL ABOUT MY ROCK!



THIS IS MY ROCK

MY ROCK FEELS LIKE:

THE COLORS IN
MY ROCK ARE:

WHY I LOVE MY ROCK:

NAME:

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ALL ABOUT MY ROCK!



DRAW YOUR ROCK

DRAW WHAT YOUR ROCK FEELS LIKE:

SHOW WHAT COLORS
YOU SEE IN YOUR ROCK.

DOES YOUR ROCK LOOK LIKE
SOMETHING ELSE? DRAW IT HERE!

NAME:

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ALL ABOUT MY ROCK!



IDENTIFY YOUR ROCK:

WHAT COLORS ARE IN YOUR ROCK?

HOW BIG IS YOUR ROCK?

WEIGHT:

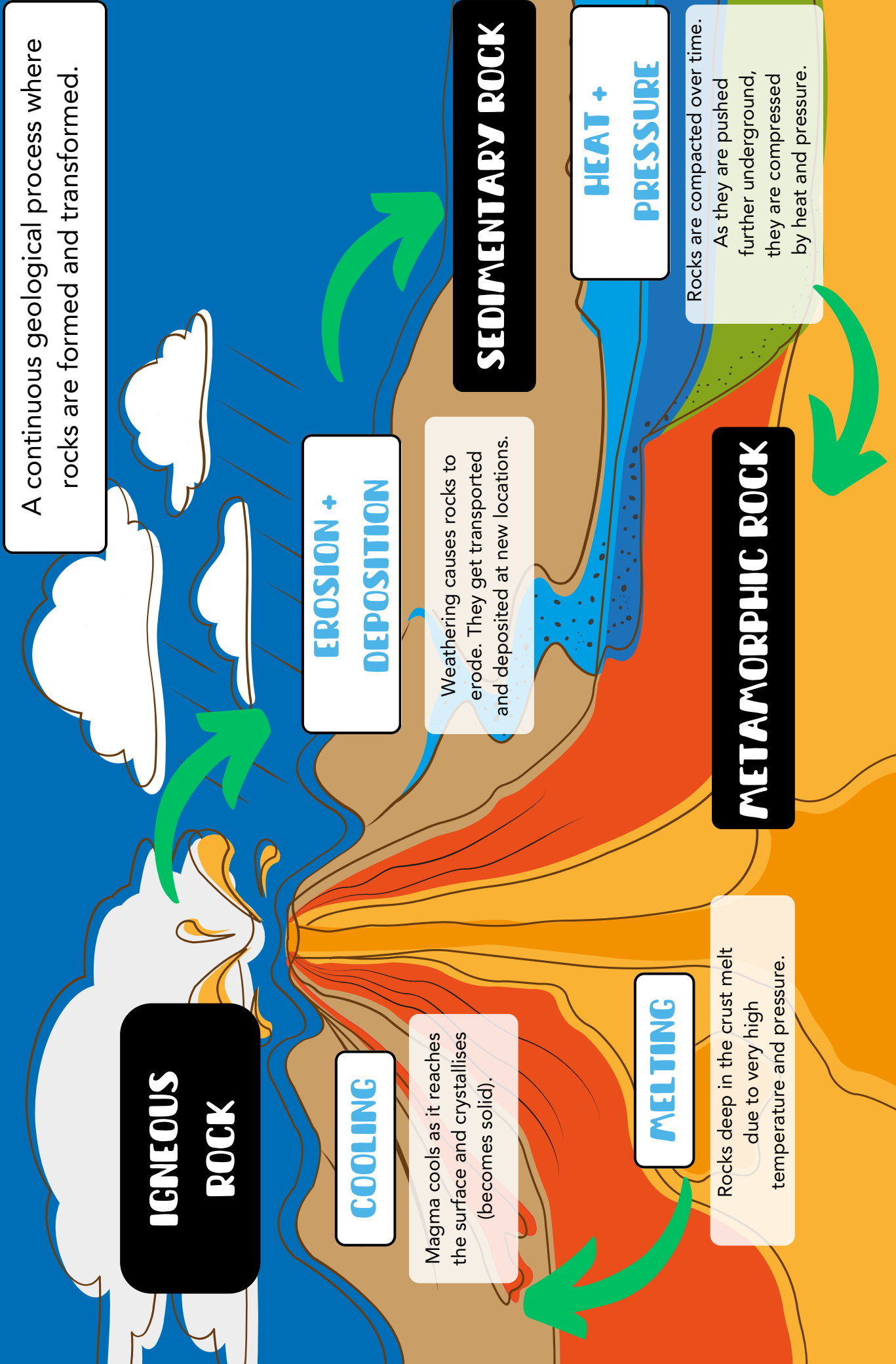
LENGTH:

HEIGHT:

WHAT CHARACTERISTICS HELPED
YOU IDENTIFY YOUR ROCK?

NAME:

GRATITUDE ROCKS: THE ROCK CYCLE



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ROCKS, MINERALS, FOSSILS

WHAT ARE ROCKS?

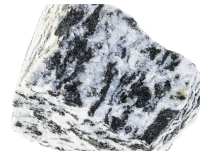
Rocks are made up of minerals and other materials. They are found all around us, from mountains to beaches. Rocks can be grouped into three main types: igneous, sedimentary, and metamorphic.



IGNEOUS:
BASALT



SEDIMENTARY:
SANDSTONE



METAMORPHIC:
GNEISS

WHAT ARE MINERALS?

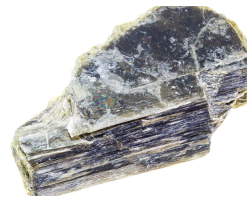
Minerals are natural substances found in rocks. They have specific chemical compositions and crystal structures. There are over 4,000 known minerals on Earth, each with its own unique properties.



QUARTZ



FELDSPAR



MICA

WHAT ARE FOSSILS?

Fossils are the preserved remains or traces of ancient life, (ex. bones, leaf print), which offer insights into past ecosystems and the history of life on earth. There are seven main types of fossils, six are below with the seventh being molecular fossils.



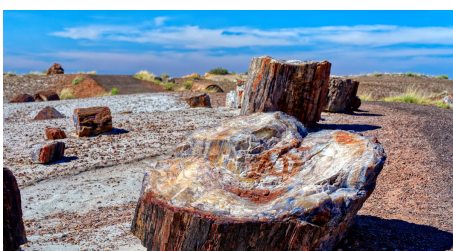
BODY FOSSILS



PRESERVED REMAINS FOSSILS



TRACE FOSSILS



PETRIFIED FOSSILS



MOLD & CAST FOSSILS



CARBON FOSSILS

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DAY TWO: CONFETTI POPPERS

Today we're going to talk about metamorphic rocks and what sets them apart in geology - pressure!

While there's not a great activity we can do to show how rocks are formed under extreme pressure, we can give some examples, like coal becomes a diamond. We can also add pressure to something to see what happens to it. So today, we're going to create a popper that uses pressure on a balloon to pop confetti out into the world. This makes for a fun game (and great photos) but it does make a mess, so biodegradable confetti (or a floor that is easy to sweep) is a must.



DAY TWO: METAMORPHIC ROCK

SUPPLIES

For the Demonstration, you will need:

- a sample of quartzite (can be borrowed or donated by a local countertop manufacturer)
- a sample of sandstone (from a local landscape company)

You will need one per camper for the activity:

- thick toilet paper tube
- scissors
- balloon
- vinyl sheets (helps make the tube stronger, you can also cover in duct tape)
- stickers to decorate the tube (optional)
- confetti (you'll want a lot of this!)

Expansion (per camper):

- paper towel tubes
- confetti
- balloon
- vinyl sheets

EXPANSION

Older campers can use their knowledge of the scientific method to try to improve upon this craft by experimenting. They can test different lengths of tube, amounts of confetti, or balloon shapes to see what makes the best confetti popper.

Campers can also use the confetti poppers to pop mini marshmallows into a cup to see how many they can get inside.

SCAFFOLD

For younger campers, they will need a bit of help with building this, but they love choosing the colors and decorating it. Have the tubes already covered in vinyl Invite kids to pick a color of tube, a color of balloon and then have helpers assemble them. In this scenario, you will attach the balloon with a piece of duct tape. They can decorate their tube with washi tape or stickers to make it their own.



PRO TIP:

If you want to be a hero to campers, you can have a small bag of confetti for each camper to take home with their popper so they can show their parents. If not, be prepared for them to smuggle confetti from the station because they all really love this activity.

TEACHING ABOUT PRESSURE

How does pressure change things??

Today in geology, we're learning about pressure. Unfortunately, it is very hard to re-create the amount of pressure and heat needed to melt a rock, so we're going to first see some examples. These are two rocks that you might be familiar with...this one is sandstone. You probably have seen this in a garden or as paving stones. It's also commonly found in the Western part of the United States. This second one, you may have also seen, is quartzite, it is found in countertops. Quartzite is what happens to sandstone when it experiences heat and pressure. Can you tell me some things that have changed between the two rocks?

1. the "sandiness" has become smooth
2. grains and variations become lines
3. "looks" more solid

Perhaps one of the most interesting things that heat and pressure does is take something ordinary and turn it into something very expensive. I've got three other examples, let's see if you can match the original rock to what it becomes under pressure.

OPTIONS:

1. You can simply print out the handouts and talk about it or make it a poster.
2. You can print out the handouts on cardstock, cut out the images and turn it into a matching game.

Let's Apply Some Pressure!

Today we are going to create something that uses pressure - a confetti popper! Each of you needs a toilet paper tube, a balloon, some vinyl, and stickers for decorating.

1. We're going to cut (or have it pre-cut) our vinyl before we peel off the backing. Use the tube to determine how big of a piece you need...you're going to lay it on top of the back, and mark the bottom of the tube, then cut a straight line across.
2. We now need to cut our balloon just a bit - you'll just snip off the rolled up part of the balloon and a little bit of the neck so it is easier to put it on the tube.
3. Now we're going to put the balloon onto the tube. Make sure to get as much of the neck onto the tube as possible.
4. Next we'll cover the balloon and the tube with the vinyl (see below).
5. Now you can use the washi tape and stickers to decorate the tube however you want!

Now it is time to test our poppers! We'll put some confetti into the tube and then pull back the balloon to add pressure and release! (Note: the angle does make a difference! They will want to "aim" it at something (or someone) but holding it straight does not have the best results. See the photo below for the best angle for projecting the confetti up and out.)



PRO TIP:

If you are asking for donations of toilet paper tubes, make sure that the tube isn't crushed by the force of balloon. If it is, you will need to reinforce the tube with duct tape and cut off more of the balloon neck. Make sure the balloon still holds on tightly - you might have to tape it. (See photo on the right for a tube that is too thin for this activity.)

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+ PRESSURE
& HEAT



+ PRESSURE
& HEAT



+ PRESSURE
& HEAT



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DAY THREE: VOLCANOES

It's volcano day in the STEAM and Geology Station! Today we are going to build and erupt volcanoes. This is going to be a shared experiment with the geology station. Depending on how your stations are set up - you'll make volcanoes in one station so they can dry, and then explode them in the other station. (Meaning if kids come to geology first, they'll build their volcanoes there and then erupt in STEAM or vice-versa.) We've also got a great expansion piece for older students or it can be used as a fun demonstration. Students will learn about lava rocks in the craft station so you will be able to reference what they are learning there depending on when they arrive at your station.



DAY THREE: IGNEOUS ROCK

SUPPLIES

To Build the Volcano You will need:

- one container per camper (you can use the water bottles from yesterday)
- to build the volcano, you will need either salt dough or air dry clay depending on your climate
- paint for decorating the volcano (if clay wasn't colorful)
- paint brushes, etc.

To Erupt the Volcano (per camper):

- baking soda 2-3 tablespoons
- vinegar - 1 Cup
- clear dish soap (a few drops)
- red food coloring (a few drops)
- tray to catch the liquid explosion

For Elephant Toothpaste (per demonstration):

- 300 ml hydrogen peroxide
 - 50% food grade hydrogen peroxide or
 - best "fun" results - 40 volume hydrogen peroxide - this can be found at beauty supply stores (just get the clear not the creme) and can be done by older campers
- 4 teaspoons potassium iodide crystals
- 1500 Erlenmeyer Flask, or similar
- 3 tablespoons clear dish soap
- food coloring
- 100 ml water

EXPANSION

Again, this same lesson is attached to the Geology Station. So work together to decide which part of the lesson is happening when. A way to expand this lesson is to do a demonstration of elephant toothpaste. We've put the instructions on the next page. Hydrogen peroxide can bleach clothes or burn eyes, so safety goggles and gloves are a must with this experiment (or just have folks stand at a safe distance). (Additionally, once the potassium iodide is re-hydrated, it can stain.)

Note on color: when this reaction happens, the iodide shows itself by adding a yellowy-orange hue to your experiment, so if you're wondering why the color is weird, it's the iodide!

SCAFFOLD

This is a great activity for young campers because they love mixing things and getting a reaction. If you want to decrease the amount of mess or even set up, you can also set this up as an outdoor experiment. Have the little ones build a mountain in the dirt or sand then place a small jar in the middle of their mound. This way they can create their volcano in the dirt/sand and see how the magma would flow down the sides like on a real mountain. It also helps contain the mess!

TEACHING ABOUT PRESSURE

Volcano Building

Today in STEAM/Geology, we're learning about how things can look like one thing, but are something completely different. Volcanoes look like mountains, which they are, but there is something much more interesting happening under the surface. We've got this poster (you can also use a video) to help us see what is happening below the surface of a volcano...as you can see, deep below the earth's surface, rocks are met with heat and pressure, which causes them to melt. This forms magma. Magma continues to build and starts to push upwards. This causes cracks inside the mountain. The magma continues to push into these cracks until it ultimately pushes through the surface as an eruption. As the magma hits the air and ground, it cools, turning it back into rock. Sometimes this happens slowly, and sometimes it happens violently. When a volcano erupts, there can also be ash and gas released alongside the magma. We're going to work together with the geology station today, so in our group time, we're going to build your volcano. Then it will dry before you get to your geology station where you'll work on the eruption.

Did you know that there are four types of volcanoes?

- The first is called a shield volcano. This is like Mauna Loa and Mauna Kea in Hawaii. These have non-explosive eruptions because they have large, gentle slopes.
- Another type is called a composite volcano. This is like Mt. Fuji in Japan or Mt. Rainer in Washington. These are steep volcanos formed by layers of lava, ash, and mud and they have very explosive eruptions. They can also erupt from multiple spots.
- Next is a lava dome, this is when a thick, viscous lava pushes up from the vent but doesn't flow very far.
- Finally, there are cinder cones like Paricutin in Mexico. These are small, steep-sided volcanoes that have a single vent at the top.
- Another good term to know is a caldera - this is the depression or hole that is formed when a volcano collapses after an eruption. This is like Crater Lake National Park.

Okay, so given this, you can decide what kind of volcano you want to make - steep sides, long slopes, tall or short. You'll grab one of these flasks and some of our air dry clay and build your volcano.

Note: if using air dry clay, you can premix the colors for the kiddos or let them experiment with the colored clay to come up with the colors they need. You may need to be ready to give ideas on how to create brown if you weren't able to find it. If you are using salt-dough, you can either have it ready for them to use or let them mix it themselves. You can use food coloring to dye the dough the colors they want, just make sure to use gloves so you don't stain your hands. The clay does not need to be fully dry for the explosions to work.

Volcano Eruption

Earlier today you built your volcanos and now we are going to erupt them! In order to make an eruption, we're going to revisit something you did yesterday but change up the ingredients. Does anyone remember what two items you combined to make the bath bombs fizz? (citric acid and baking soda) We're going to use the same base, baking soda, but combine it with a new acid, vinegar. To make it a bit more fun, we're also going to add some clear dish soap and food coloring, because what fun is lava if it isn't red? So our first step is to combine our baking soda, dish soap and food coloring until it looks kind of like wet sand. Then we'll put that in the bottom of our volcano. Once we are ready (and our volcano is safely on a tray) we'll add our vinegar, fast, but not so fast that it doesn't go in the jar and make the reaction.

Did you notice that the volcano didn't explode right away? That's because the pressure (or in the case of our volcano, the bubbles) had to build up before the reached the surface.

How might we change the reaction? (Let them change the ratios and make another reaction!)

Once we've finished our reactions, we're going to dump all of the liquid out of our volcanoes carefully so you can take your volcano home today and do this experiment again.

PRO TIP:



Build the volcanoes on a disposable pie tin so they are easy to transport home at the end of the day. Use a piece of tape to label the tins with the campers names and put near the pick up area so they can be easily retrieved. We also recommend putting a note with them (or by them) so parents know how much baking soda and vinegar to use.

DEMO/EXPANSION

Elephant Toothpaste

Today, we're going to have a demonstration that you've probably seen on television called elephants toothpaste. You are going to help me get everything ready, but then I'm going to ask you to step back because the chemicals once combined can cause burns or issues with your eyes. That's why I'm going to wear gloves, an apron, and eye protection, In science, safety is always first.

Please note: the ratios here are based on a 1500 Erlenmeyer Flask. If you are using a bigger or smaller container, please practice, and scale your ingredients.

1. Get a small beaker or measuring cup.
 - a. Put 4 teaspoons of potassium iodide crystals in the beaker.
 - b. Add 100 ml of water.
 - c. Stir to dissolve.
2. Place your flask on a flat surface (we recommend doing this outside for easier clean up).
 - a. Pour in 300 ml of hydrogen peroxide.
 - b. Add food coloring - if you want to get fancy, you can try using a gel food coloring and have it stick to the sides of the bottle to create stripes during the explosion.
 - c. Add 3 tablespoons of clear dish soap into the bottle - swirl it around carefully to combine.
3. Now, stir your potassium iodide one more time, then pour it quickly into your flask and step back!

Variations:

Option One - Safe and Easy to Find Ingredients:

You can do this same experiment using yeast and hydrogen peroxide that you can get at the store. This is very safe and older kiddos can do it themselves. It will not have as big of a reaction but it is still really fun. This is a great opportunity to teach the scientific method to older kids. Simply change the type of peroxide you are using and measure the results each time. You can also have them change the amounts of the reactants and dish soap to see if they get different results. Again, if you are having students work with the materials, make sure they have gloves and safety goggles and an apron to protect their clothing.

Option Two - Compare Reactions:

The only thing better about eruptions is having more of them! A great way to show the scientific method is to tell the campers you're going to change one variable in the experiment to see which has the biggest eruption. You can change the flask size, the amount of soap, or you can use three types of hydrogen peroxide: 3% (found at drug stores), 40% (found at beauty supply stories, but be sure to get clear not creme), and 50% (from the supplier found in the directors guide).

One last idea - this is a fun one that is totally safe but very sticky. You can create the same explosion using dark soda and mentos. Simply drop 7 mentos into a room temperature two liter bottle of dark colored soda and watch it explode! We tested this with a clear soda, orange soda, ginger ale, diet and regular cola to see which had the best reaction. The darker the cola the bigger the reaction. Diet didn't really change the reaction but it did make for a less sticky clean up.



PRO TIP:

We spent an entire morning perfecting our elephant toothpaste until it was Middle Schooler approved. We noticed two things with this ratio: the exothermic reaction was visible - there was steam rising from the foam, so it was easy to see that it got warm. One of our gloved testers moved the foam off of the flask mid-eruption (orange foam) and then it created the cool tubes like toothpaste, and you can see how much foam was on the ground from the first part of the reaction!

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HOW A VOLCANO ERUPTS

NOTE: MAGMA AND LAVA ARE THE SAME THING!

LAVA IS WHEN MAGMA IS ABOVE GROUND, MAGMA IS LIQUID ROCK FOUND BELOW GROUND.

5

LAVA FLOWS & COOLS

Lava spills down the sides, hardening into new rock.

4

ERUPTION OCCURS

Magma bursts out of the rock due to increased pressure as lava, ash, and gas

3

CRACKS OPEN

As the magma increases, it creates pressure on the rocks, causing it to crack.

2

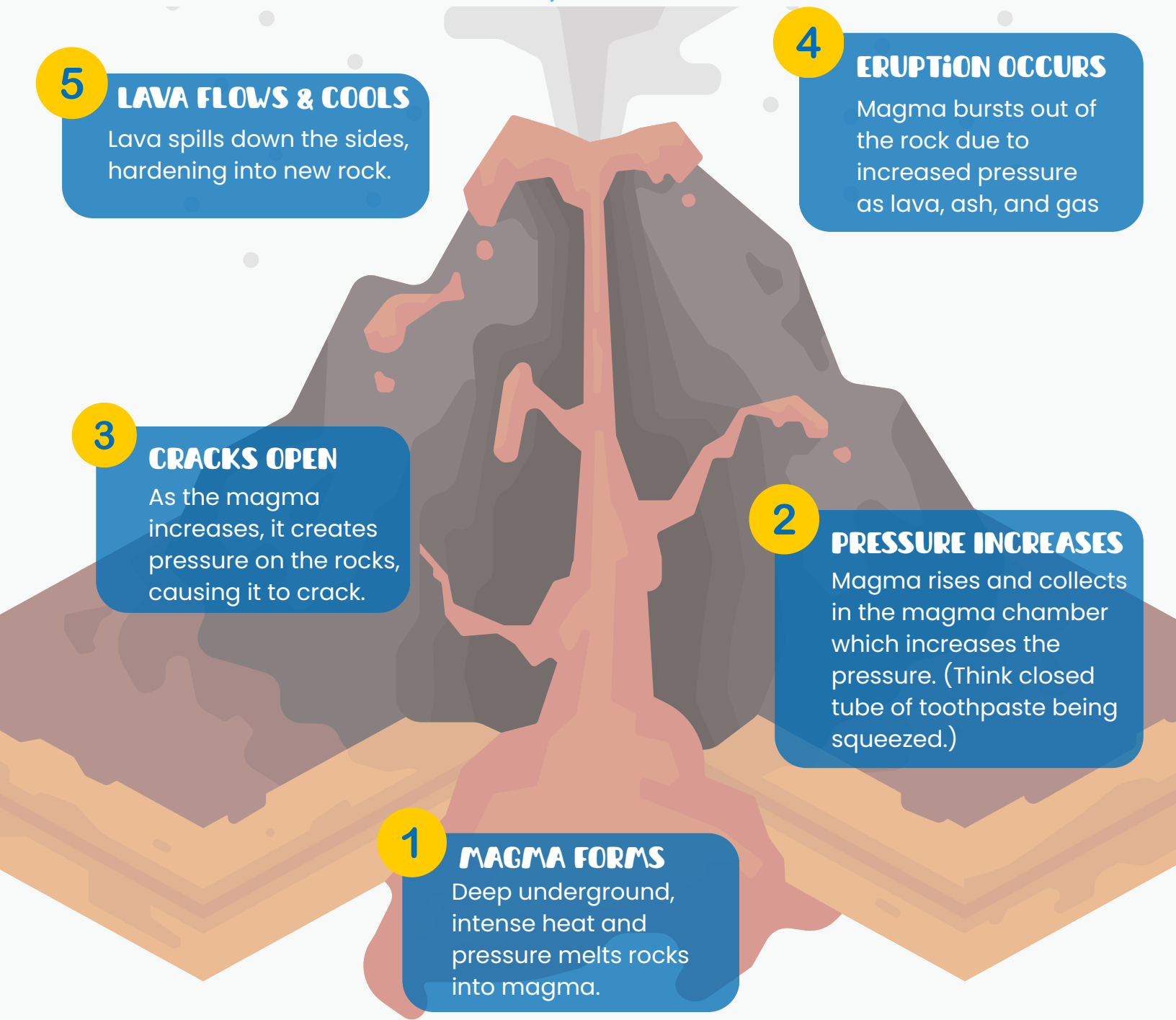
PRESSURE INCREASES

Magma rises and collects in the magma chamber which increases the pressure. (Think closed tube of toothpaste being squeezed.)

1

MAGMA FORMS

Deep underground, intense heat and pressure melts rocks into magma.



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VOLCANO TYPES



1

SHIELD VOLCANO

Large, broad volcano
with gentle slopes



2

COMPOSITE VOLCANO

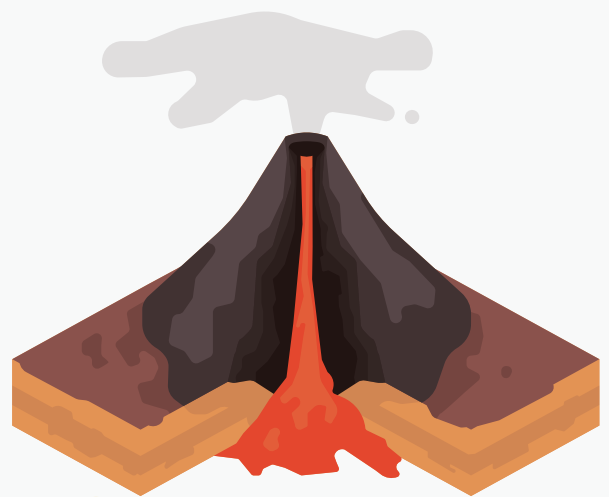
steep-sided,
symmetrical cone - can
have multiple vents



3

LAVA DOME

Formed when lava
pushes up but doesn't
flow far



4

CINDER CONE

small, steep-sided
volcano constructed
from loose fragments

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DAY FOUR: FOSSILS!

Today we are going to talk about fossils. Sedimentary rock is the most common type of rock to find fossils in because of how the stone is created (think about a dinosaur dying in the mud, their bones are preserved as the ground is dried). Because many of our campers may be a big fan of dinosaurs, we wanted to dedicate sometime today to fossils. This is an opportunity to plan ahead and see if your local natural history museum might be willing to come out for a visit so that kiddos can get a hands on experience with fossils. Some even will join more remote areas via zoom to present fossils to your group. If not, we've got you covered with some suggested resources to teach about fossils.



**DAY FOUR:
SEDIMENTARY ROCK**

SUPPLIES

If you are not inviting someone to come present about fossils, we've got a couple of resources that can help you create an interactive lesson on fossils.



1. The Smithsonian has great videos from their fossil prep lab so students can learn about how fossils are prepared for display at museums and for research. There's one from the pandemic that teaches kids to draw fossils.



2. Dancing Bear Rocks & Minerals has a Fossil Sorting Activity Kit that includes over 100 pieces and 20 different fossil types or a 12 piece fossil collection kit that has larger fossils. This is a great resource to use if you can't get the museum to come to you. Kids will get to interact with fossils and take a look at the geological timescale. You can also likely find something similar elsewhere online or at a local rock shop.

3. Skeleton kits - there are kits online that kids can build a model of a skeleton.
4. Many museums have a virtual visit complete with activity sheets, one example can be found using the QR code.



EXPANSION

See if your older campers can build their own dinosaur skeleton using pipes or cardboard tubes! This one is a lot of fun, but does take a great deal of time. We recommend beginning with a photo that they can "copy" (and so you can make sure you have enough pieces to help them succeed) or at least know how the skeleton goes together.

SCAFFOLD

Younger campers may find the activities too hard to follow (like the fossil sorting or building a skeleton) so we recommend using a modified salt dough technique:

- 1 cup wet/used coffee grounds
- ½ cup cold coffee
- ½ cup salt
- 1 cup flour (add more if sticky)

Mix the ingredients together to form your soil. Then have a variety of objects for campers to fossilize (plastic dinosaur skeletons, leaves, plants, etcetera to the "mud" and talk about how this is the first step in how fossils were created. Let the rocks (with fossils exposed) dry overnight and then talk tomorrow about how this is how scientists find fossils - embedded in the rocks and needing to be dug out! Or use a mineral dig kit!

GRATITUDE ROCKS!

A Vacation Bible Camp Curriculum Focused on Gratitude, Geology, & Fun

DAY FIVE: CRACKING A GEODE

Today is our last day of camp and we're going to go out with a bang - we're going to smash some geodes! In the STEAM station, campers are going to make their own geode, so here in the geology station, we want them to engage first hand with real geodes. Please be sure to take note of the scaffold today. Since we're using hammers, you'll either need to give a lot of help to younger campers or swap out to a demonstration and mineral dig kit.

Today is the last day, so make sure campers take everything they have worked on in your station with them.



DAY FIVE: MINERALS & GEMS

SUPPLIES

You will need for each camper:

- one geode

For the group to use:

- safety goggles for each person
- hammers and chisels for opening geodes
- heavy sock or bag

For the scaffold:

- mineral (or similar) dig kit per camper
- tray/pie pan for working
- water with pipettes (to soften the dig kit as needed)
- paint brushes

Note: sometimes you'll get a geode that has completely filled in with quartz. These are really hard to break so you may want to have some extras in case a camper needs to swap out their geode for one that is easier to break open.

EXPANSION

No need for expansion today, cracking geodes is a hard task, you could always buy bigger geodes for the older campers as they are bit more difficult to break open.

SCAFFOLD

For younger campers this activity might be beyond their abilities to do safely, with that said, it is good to have a geode for them to see and engage with so a demonstration is useful.

For our younger campers, we'll swap out breaking a geode with using a prefabricated mineral dig kit. Given the amount of time you have in stations, get small ones and buy in bulk. Little campers love digging for treasure so this lets them try on being an archeologist or a paleontologist! I like to have paint brushes (to brush away dust) and water with pipettes available to help kids with the project. Adding a little water will soften the material and make it easier to dig.

PRO TIP:

One way to tell if a rock is a geode is that it weighs less than a rock of a similar size. You can show this to campers by buying a big geode and finding a rock to match. Let them hold them and guess which is which.



TEACHING ABOUT HIDDEN GLORY

What Makes Geodes So Special?

Today we are finishing up the week talking about all of the ways that each of us is a gift to the world around us, even if we don't see it yet or maybe others don't see it yet. There is a very cool rock that we are learning about today called a geode. It looks like a very basic, boring rock, but when you open it, it has beautiful crystals inside. Geodes are created when pockets of air form inside the rocks. How does air get inside a rock? Great question! Air pockets can form inside a rock during a volcanic eruption when lava cools around a bubble of air. They can also form when organic material trapped inside of a rock dissolves. Once that pocket forms inside the rock, groundwater, which is filled with different minerals, seep through the rock and that air pocket. As the water escapes, minerals found in the water remain. These minerals (ex. quartz, iron, titanium, nickel, chromium, manganese) over thousands of years form crystals inside the rock. The color of the crystals depends on the mineral that created it. The most common geode contains quartz, which typically has a milky white color.

Opening Geodes

Today we are going to open a geode! There are a few things to know before we start and some safety concerns to take note of. First off, when a rock breaks, it can sometimes be like glass. If you've ever dropped a glass, you know that it doesn't break into two nice pieces, sometimes there are small bits that fly off. This is why we want to protect our eyes with safety goggles. Second, we don't know what is inside, sometimes the quartz has completely closed off the inside of the geode. In this case, we won't be able to crack it easily. If you are struggling to open your geode, please bring it back and we'll trade it out for a different one.

The first thing you want to do is inspect your geode. Often you'll see a small crack or a line on the rock - this is the best place to start because it is where there is a fissure already naturally occurring in your rock and it will make it easier to get it open. If you want to use the chisel, you will want to work at making a line around the geode. Then you can hit the crack you created with a few good hits and it should split at the line you created. If you don't care about how it breaks open, you can put it in a bag/sock and just smash it with the hammer. This will keep the pieces from flying off. Please note that it is better to go slow, because if you hit the geode too hard it can completely smash the rock and you won't have a nice specimen left to take home with you.

Scaffold

Not everyone should swing a hammer. If you have smaller/younger campers, we suggest using a premade mineral dig kit as described on the previous page. With that said, it is good to show them a geode or even have one of the older campers demonstrate opening one of the geodes.



PRO TIP:

If you have a lot of younger campers and still want them to experience geodes, you can have them "try" to break it open with safe hammers. With small geodes, these should break open with a quick hit of a hammer. We also found it helpful if there's a crack in your pavement to lodge it in the crack to hold it in place.

You can also put the geode in a sock while helping younger campers hit them with a big hammer. This keeps any rock particles from flying out but gives them the satisfaction of breaking their own geode.