

GEOLOGY

EARTH SCIENCE

1. Research the Earth to learn about the plates that cover its surface. See if you can find out about the theory of plate tectonics and explain it to a classmate or an adult.
2. Demonstrate how the Earth's plates move and what happens when they move against each other. You will need:
 - Graham crackers
 - Waxed paper spread with peanut butter or frosting
 - a) Put two graham crackers very close together on the waxed paper and slowly push them apart. You have made a "rift" or big crack in the ocean floor. As the plates separate, magma oozes up from below and makes new ocean floor or creates underwater mountains.
 - b) Push two graham crackers toward each other, making one slide underneath the other. When this happens on earth, the bottom plate starts to melt from the intense heat and pressure. It becomes new magma that floats up between the two plates, building up and up over many years until it finally causes a volcano blast.
 - c) Put two graham crackers side by side and slowly push them together. The ridge of pushed-up cracker is just like many mountain ranges around the Earth that were formed as two plates slowly crumbled together over millions of years.
 - d) Put two graham crackers side by side and slide one away from you and the other toward you. When plates move past each other like this, things don't go smoothly. Plates usually get stuck on each other and then give a great lurch and move on, sending waves of vibrations through the Earth's interior, causing earthquakes.



3. Create a four-fold book about plate tectonics. See your teacher for directions.
4. How and where are earthquakes measured? Find out about the scale that measures the amount of energy that earthquakes release.
5. Try to visit the National Earthquake Information Center in Golden, Colorado to learn more about how they measure and monitor earthquakes around the world. Tours are free, but you need a reservation. <http://earthquake.usgs.gov/regional/neic/>
6. You can see how earthquakes are measured in this simple demonstration. You will need:

- A box
- Scissors
- Wooden dowel or rolling pin
- Tape
- White paper
- Pen
- Table
- Partners



- a) Tape a piece of paper around the dowel or rolling pin.
 - b) Cut the box so that the dowel or rolling pin fits in as shown in the picture.
 - c) Hold the pen so it just touches the paper. Have one partner turn the dowel or rolling pin slowly. Notice the line that is made on the paper. Now, have the other partner shake the table and notice how the line changes.
7. What is the relationship between earthquakes and the Earth's plates? Where do earthquakes tend to happen? What is this area called?
 8. Research a famous earthquake, like the San Francisco earthquake of 1906.
 9. See Ms. Bass or check the library for "I Survived the San Francisco Earthquake, 1906 (#5 in the "I Survived" series).
 10. How are buildings built to withstand earthquakes? Try having a contest with classmates or friends to see who can build an earthquake-proof building. Make sure that you all use the same building materials (blocks, sponges, tubes, shoe boxes, etc.),

but you use them differently. Once you are done building, create a way to shake your structures (washing machine, moving table, etc.).

11. Create a flap book that shows the layers of the earth. See your teacher for directions.



12. What causes volcanoes to erupt? Make a diagram or a model to show the parts of a volcano and what causes it to erupt.

13. Explain how volcanoes are builders and shapers of land and life on Earth.

14. Research a famous volcano and its eruption, like the Mount St. Helen's eruption in 1980 or Mount Vesuvius in Italy in 79 AD.

15. With an adult, watch Mount St. Helen's eruption and listen to the scientists that were studying it. <http://www.youtube.com/watch?v=xP2dreOI8gl>

16. Read The Dog of Pompeii. You can find the story here: <http://my.ccsd.net/userdocs/documents/y3iY4r6dY3JjYVat.pdf> Answer related questions as directed by your teacher.

17. Why are volcano scientists called vulcanists? Who was Vulcan?

18. Read Dear Katie, the Volcano is a Girl. How can both science and mythology be accurate?

19. How are islands formed? Create a way to show what you have learned.

20. Create a mobile that shows what you know about the three types of rocks – igneous, sedimentary, and metamorphic. See your teacher for directions or create your own design.

21. Create a diagram of the rock cycle that shows how any of the rock types (igneous, sedimentary, and metamorphic) can become a different rock type.

22. What is a mineral? How is it different from a rock? What are some minerals? Where are minerals found? How will you show what you have learned?

23. In this experiment, you will see how igneous rocks are made. You will need an adult to help you and:

- ½ cup chocolate chips
- ½ cup butterscotch chips
- ½ peanut butter chip
- A nonstick sauce pan
- A greased bowl (at least 1 pint in capacity)

- a) Put all three kinds of chips in the sauce pan. The chips represent different minerals.
- b) Heat the chips over a low heat with your adult helper. Stir them every few minutes. This process is similar to how minerals melt and mix to become igneous rocks deep within the Earth.
- c) When the chips are completely melted, have your adult pour the mixture into the greased bowl. Allow the mixture to cool overnight. Some igneous rocks are formed when magma cools within the Earth. Some igneous rocks are formed when lava cools on the Earth's surface.
- d) Remove the mixture from the bowl and set it on a paper towel or plate so you can observe it. What do you see? Describe how the finished “igneous rock” is different from the “minerals” that you started with.

Can igneous rocks turn into different igneous rocks? To answer that question, do the following experiment with an adult helper.

- a) Put your chip “rock” back into a sauce pan and heat it slowly until it is melted again.
- b) Add a new “mineral” to the mixture – a cup of white chocolate chips. Stir them until they are melted. Turn off the heat.
- c) Put the mixture into a greased bowl and let it cool overnight.
- d) Compare your new “igneous rock” to the original “rock.” What is different? What is the same? Explain how this shows the igneous rock cycle.

24. The word “metamorphic” comes from the word “metamorphosis.” What does that mean? How does that connect to how metamorphic rocks are formed?

25. Demonstrate the process of how metamorphic rocks are formed. You will need:

- 3 slices of bread that are different in color (white, wheat, dark rye)
- Wax paper
- A rolling pin
- A plastic knife and cutting board



- Stack the three slices of bread in any order and squeeze them between your hand and the cutting board so they just stick together.
- Cut the stack in half and observe the layers. This represents sedimentary rock.
- Stack the two halves on top of each other and wrap loosely in the wax paper.
- Now use the rolling pin to really flatten out the stack. This pressure represents the pressure that metamorphic rocks go through.
- Then unwrap it. How has the size changed?
- Cut it in half. How are the layers different? Does the “rock” feel the same or different?

26. Sedimentary rocks form from smaller bits and pieces of other rocks. To demonstrate this, you will need:

- A clear, empty two liter soda bottle with a cap
 - A cup of sand
 - A cup of small gravel
 - A cup of medium gravel (small enough to fit into the bottle)
 - Water
- Add the sand and both gravels to the bottle.
 - Fill the bottle about 2/3 full with water and put the cap on tightly.

- c) Shake and swirl the contents for about 15 seconds.
- d) Let the contents stand for about a minute and then look at the bottle from the side. Are the three different sediments mixed together or did they settle into layers? What might this look like in nature?

27. To see how sediments bond together in nature, complete this demonstration. You will need:

- 2 paper cups
 - Small gravel pieces
 - White or wood glue
 - Scissors
 - Water
- a) Put the gravel in one of the paper cups. In the other cup, mix 8 ounces of glue with 2 ounces of water. Have an adult help you measure.
 - b) Pour about half of the glue mixture into the cup of gravel and mix everything around. Make sure that all of the gravel is well coated with glue. Press the mixture solidly into the cup.
 - c) Let the mixture stand for a day. Then cut away the cup and you have a sedimentary rock. In nature, minerals in water act like the glue to cement the sediments together.

28. Research a famous rock formation, like Devil's Tower or Mount Rushmore. Tell what kind of rock it is and how it was formed.

29. What is a fossil and how do they form? Can they form in all three types of rocks? Why or why not?

30. Which of the following are fossils? Which are not?

Hint: **4 are fossils**

- | | | |
|-----------------------------|------------------------|-------------------------|
| • Stone tablet with writing | • Dinosaur bone | • Arrowhead |
| • Frozen mammoth | • Petrified tree | • Cave painting |
| • Pyramids of Egypt | • Leaf print in stone | • Handprint in concrete |
| • Piece of coral | • piece of old pottery | • Mummy |

31. You can make your own “fossil” mold. You will need:

- An adult to help you
- 3 cups of Plaster of Paris
- Plastic Ziploc bag
- Aluminum pie pan
- Petroleum jelly
- Sand
- Food coloring

- a) Pour the plaster and 1 cup of water into the plastic bag.
- b) Carefully squeeze the mixture until all of the lumps are gone and it looks like cake batter.
- c) Pour it into the pie pan.
- d) Press your hand into the plaster to make an impression.
- e) Wait a few hours until the plaster is dry. You have a “fossil” imprint of your hand.
- f) DO NOT FLUSH OR POUR EXTRA PLASTER DOWN THE DRAIN OR INTO THE TOILET. Use the trash only.
- g) After the mold is dry, smear it with petroleum jelly.
- h) Mix another batch of plaster, this time with food coloring and sand.
- i) Pour the mixture over your mold and let it dry.
- j) Have your adult pry around the edges and separate your mold from your cast. You should have a cast of your hand.

32. You can demonstrate how petrified fossils are made. You will need:

- Scissors
- An old sponge
- a cup and shallow pan
- Epsom salts
- food coloring

- a) Cut two pieces of sponge into bone shapes. Set one aside.
- b) Have an adult help you fill a cup with hot water.
- c) Stir in Epsom salts until no more will dissolve.
- d) Add a few drops of food coloring. Pour this mixture into the pan.
- e) Put one bone sponge into the pan and watch the water travel through the holes.
- f) Set the pan in a place where it won't be disturbed for several days.
- g) When the sponge is completely dry, feel it. Is it harder or softer than the other sponge that you set aside. Look carefully in the holes. What do you see?
- h) How is this demonstration like the natural process of petrification?

33. Sand compressed for millions of years becomes sandstone. This sedimentary rock is sculpted into amazing formations by wind and water blasting away at it. Create your own sandstone sculpture. You will need:

- 2 cups of sand
- 1 cup of water
- 1 cup of cornstarch
- An old sauce pan
- Paint (optional)



- a) Combine the sand, water, and cornstarch in the pan. With an adult's help, heat the mixture slowly until it's thick.
- b) Let it cool. Then use your hands to mold it.
- c) Let your sculpture dry. You may paint it, but don't have to.

34. People all over the world play Mancala. In Africa, kids play with pebbles and a game board of shallow holes scooped out of the ground. A "standard" **Mancala** board is composed of six pits on each side of the board, and a larger scoring pit on each side. Two players sit across from each other over the board. The large scoring pit to each

player's right is his/her scoring pit. See if you can find a Mancala game to play or make your own from an egg carton. Ask an adult to help you find the directions.

35. Create a science wheel called “What Rock is it?” See your teacher for the materials.

36. Pick a subject that you are studying in science. Read more about that topic. Then make a circle book that shows what you have learned. See your teacher for directions.

37. What is a crystal? Did you know that you can grow your own crystals! You will need:

- A jar
- Water
- About half a cup of salt
- A spoon for stirring
- String
- Scissors
- A pencil



a) Fill the jar with water.

b) Add about half a cup of salt to the water. Mix the solution together with a spoon.

c) Cut a piece of string with scissors and tie it around the pencil.

d) Make sure that the string dangles into the middle of the solution. If you need a weight, try tying a paper clip to the bottom of the string.

e) Leave the experiment and wait for salt crystals to form along the string. Try looking at them with a magnifying glass or a microscope. Are they perfectly formed? What shape are they? What color? Can you see any microorganisms on the crystals?

If you want to see faster results, you can use a recipe that involves hot water. You will need an adult to help you 1) find a “recipe” that involves heating the water solution and 2) use the stove safely.

38. If you have another idea, please see your teacher.