Lab Investigations: Earth Science

Oak Meadow

Lab Manual

Oak Meadow, Inc.
Post Office Box 1346
Brattleboro, Vermont 05302-1346
oakmeadow.com

Item #b075120
ISBN 978 16 84270 88 0
v.0817

Table of Contents

Unit I: Scientific Habits

Unit II: Space

Unit III: Earth

Unit IV: Meteorology

Unit V: Environmental Science

Appendix

Lab Investigation: Water Clock

Water was sometimes used to measure time before clocks and watches were invented. In this investigation, you will make a water timer.

Materials

- an empty plastic milk container (or any other clear container that you can puncture)
- large pan or bucket
- metric ruler
- marker
- clock or watch
- sewing needle or push pin

Procedure

1. Fill the plastic container with water. Mark the container at the top of the water line. This is your "fill" line.
2. Position it so one corner hangs over the edge of a counter or table. Place the large pan or bucket beneath the container.
3. Use the sewing needle or push pin to poke a very small hole near the bottom of the container. Start timing the water flow as soon as you make the hole. Make sure the pan beneath it is in the right spot to catch the water!
4. As the water flows, mark the container showing the water level at regular time intervals. This is called calibration. You are determining the amount of water that flows in a certain amount of time. Depending on the size of the drip and amount of water you are using, your water marks might be made every 15 seconds, every 30 seconds, or every minute.

5. When all the water has run out of the container, note how much time it took for all the water to drain out. Write this down, and mark your container to show how much time each interval measures. For instance, if it took seven minutes for the water to drain out, and you made a mark for each minute, the top “fill” line would be marked 0, the first minute mark below is marked “1 minute,” the next minute mark is labeled “2 minutes,” etc., down to the bottom line, which is labeled “7 minutes.”
6. Refill the container (you can use the water in the pan or bucket). Hold your finger over the hole at the bottom of the container while you are filling it to keep water from spilling out. Place it on the edge of the counter over the bucket and let go of the hole.
7. Do a household activity, such as make your bed, put away the dishes, or go collect the mail. When you finish, come back and look at the water container. How long did the activity take according to your water clock?
8. Bonus challenge: Create a water alarm clock! Can you set up a system so your water clock will make noise when a certain amount of water has fallen into your pan?

Conclusions

1. Write a summary of the procedure you followed in this investigation and how successful it was.

2. What worked well? What was difficult?

3. What might you do differently next time in order to make a more accurate or useful water clock?

4. Based on your lab investigation, do you think a water clock can be an accurate way to measure time? Why or why not?

Lab Investigation: Sedimentation

This lab demonstrates the sedimentation process, which is the first step in how sedimentary rocks are formed.

Materials

- sand, dirt, and tiny pebbles (about a handful, total)
- glass jar
- water
- spoon

Procedure

1. Mix the dirt, tiny pebbles, and sand in a glass jar filled with water. Stir until everything is well mixed.
2. Let the mixture sit and settle, untouched. Check it every ten minutes and record your observations on the data table below.
3. When the water is basically clear again, note how long it took for sedimentation to happen.

Data Table: Sedimentation Observations

TIME	OBSERVATIONS

Conclusions

1. Summarize the results of this investigation. How long did it take before you noticed sedimentation begin to happen? How long for it to be complete?

2. Carefully lift the jar without disturbing the contents. Examine the layer of sediment on the bottom of the jar and write a description of what you see.

3. Explain how this process demonstrates the first step in the process of creating sedimentary rocks. What else would need to happen in order for the sediment in your glass to turn into sedimentary rock?

Lab Investigation: Rock Cycle

Safety note: This lab uses a sharp knife and high heat and should be done with adult supervision.

In this lab, you will simulate how the three types of rock are formed and can change into one another.

Materials

- 4 walnut-sized lumps of beeswax, OR 4 crayons, OR 8 pieces of chewy candy (such as jelly beans or Starburst)—whatever material you choose, you'll need four different colors
- knife, peeler, or old grater
- small plastic bag
- dish towel
- wooden mallet or small hammer
- tin foil
- metal spatula
- cast iron skillet (or heavy oven-proof pan)

Procedure

1. Use the knife or peeler to shave off tiny pieces of the wax or crayons, or cut the candy into small pieces. You can also use an old grater to shave off pieces. Keep the colors separate. This will give you pieces of "sediment" that represent the layers of rocks, sand, gravel, and the remains of sea creatures.
2. Layer the "sediment" into a small plastic bag, one color at a time. Cover it with the dish towel (to keep the plastic bag from tearing apart).

3. Use the mallet or hammer to smash the sediment together. Give it a few strong strikes and then check to see if the sediment is forming a "rock," holding together in a blob. If not, hit it a few more times until the pressure causes the sediment to stick together. If it is a cold day, it may take longer for the pieces to come together than it will on a warm day. Imagine this process taking millions of years as particles are pressed together underground and the minerals combine, solidify, and harden.
4. Remove the newly formed sedimentary rock from the bag. You can often see the layers in a sedimentary rock. Can you see the different layers of sediment in your new rock formation? Write down your observations in the data table below.
5. Next, you will apply heat and pressure to transform the sedimentary rock into a metamorphic rock. Wrap your "rock" in tin foil. If you are using beewax or crayons, place it in a cast-iron skillet on medium heat and press on it with a metal spatula (be very careful of the hot pan!). After 30 seconds, flip it over and repeat, pressing for 30 seconds. Carefully remove the hot "rock" from the pan and let it cool inside the tin foil. Imagine another million years or so has gone by as the rocks slowly move further underground and are exposed to greater pressure and heat.
6. If you are using candy, place the rock wrapped in tin foil in the oven with the heavy cast iron skillet or oven-proof pan on top. Heat it at 250° for 5 minutes. Carefully remove it from the oven and let it cool.
7. Open the foil and peel the newly formed metamorphic rock away from the foil. It's okay if it breaks into pieces (that's weathering!). Write down your observations. Does the rock look different than it did before heat and pressure were applied? You can often see the different types of minerals that have combined to form a metamorphic rock.
8. Now you will change the rock once again by melting it into an igneous rock. Cover the cast iron skillet with tin foil, making sure all the sides are covered. Put the metamorphic rock into the pan, on the tin foil.
9. Place the skillet on the stove on high heat.
10. Watch it carefully! The "rock" will begin to melt. **Be very careful not to touch the melting substance because it will be very hot and can cause a very serious burn.**
11. When the substance is completely melted and bubbling, turn off the heat. Don't remove it from the pan; just let it sit until it has completely cooled. This represents igneous rock, superheated beneath Earth's crust and cooled into rock form.
12. Write down your observations. What changes do you see?

Data Table: Rock Formation Observations

ROCK TYPE	OBSERVATIONS
Sedimentary	
Metamorphic	
Igneous	

Conclusions

1. Write a brief explanation of how this lab demonstrated the formation of different types of rocks and the rock cycle.

2. What might have happened if you had applied heat but not pressure? How might your results have changed if you applied pressure but not heat?

3. Could you predict what would happen or were you surprised by your results?

4. Did this investigation help you better understand the rock cycle?